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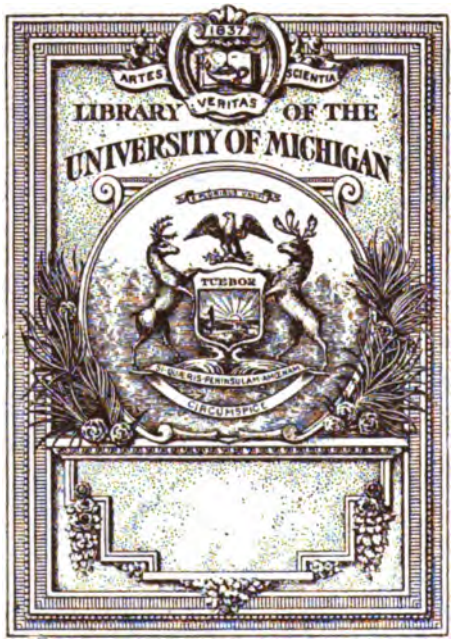
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SESSIONAL PAPERS.

VOL. XXXV.—PART V.

FIRST SESSION, TENTH LEGISLATURE

OF THE

PROVINCE OF ONTARIO.

SESSION 1903.

TORONTO:
PRINTED AND PUBLISHED BY L. K. CAMERON
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1903.

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No. 17.. Report of the Fruit Experiment Stations of Ontario for the year 1902. Presented to the Legislature, 26th May, 1903. *Printed.*

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No. 19.. Report of the Entomological Society for the year 1902. Presented to the Legislature, 21st April, 1903. *Printed.*

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No. 33.. Report of the Inspector of Division Courts for the year 1902. Presented to the Legislature, 19th May, 1903. *Printed.*

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No. 38.. Report upon the Lunatic and Idiot Asylums of the Province for the year ending 30th September, 1902. Presented to the Legislature, 21st March, 1903. *Printed.*

No. 39.. Report upon the Prisons and Reformatories of the Province for the year ending 30th September, 1902. Presented to the Legislature, 21st March, 1903. *Printed.*

No. 40.. Report upon the Hospitals and Charities of the Province for the year ending 30th September, 1902. Presented to the Legislature, 21st March, 1903. *Printed.*

No. 41.. Report upon the Ontario Institution for the Education of the Blind, Brantford, for the year ending 30th September, 1903. Presented to the Legislature, 21st March, 1902. *Printed.*

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No. 42.. Report upon the Ontario Institution for the Education of the Deaf and Dumb, Belleville, for the year ending 30th September, 1902. Presented to the Legislature, 21st March, 1903. *Printed.*

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No. 45.. Report of the Provincial Municipal Auditor for the year 1902. Presented to the Legislature, 21st March, 1903. *Printed.*

No. 46.. Return from the Records of the General Elections to the Legislative Assembly on 29th May, 1902, shewing:—(1) The number of Votes polled for each Candidate in each Electoral District in which there was a contest. (2) The majority whereby each successful Candidate was returned. (3) The total number of Votes polled in each District. (4) The number of Votes remaining Unpolled. (5) The number of Names on the Voters' Lists in each District. (6) The Population of each District as shewn by the last Dominion Census. (7) Similar Statements as to any Elections held since the General Election. (8) A General Summary of Votes cast in each Electoral Division. Presented to the Legislature, 10th March, 1903. *Printed.*

No. 47.. Report of the Librarian on the state of the Library. Presented to the Legislature, 10th March, 1903. *Not Printed.*

No. 48.. Return from the Records on the vote for and against the adoption of the Liquor Act, 1902, shewing:—(1) The number of Polling Subdivisions. (2) The number of votes for and against the adoption of the Act. (3) The total number of Votes polled. (4) The number of votes remaining unpolled. (5) The number of names on the Voters' Lists. (6) The number of Ballot papers sent out to each sub-division. (7) The number of Ballot papers used. (8) The number unused. (9) The number of rejected and spoiled Ballots, and (10) The Population of each Electoral District. Presented to the Legislature, 10th March, 1903. *Printed.*

No. 49.. Report of the Temiskaming Northern Railway Commission for the year 1902. Presented to the Legislature, 21st March, 1903. *Printed.*

No. 50.. Report upon the Sugar Beet Experiments in Ontario for the year 1902. Presented to the Legislature, 12th May, 1903. *Printed.*

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Assembly; and the Report of the Royal Commission appointed, together with the Arguments of Counsel and Evidence taken before the Commission. Presented to the Legislature on the 18th March, and the 4th June, 1903. *Printed.*

No. 52.. Report into the loss and damage caused by the Cyclone which devastated a portion of the Province, in Dundas and Stormont during the year 1902. Presented to the Legislature, 25th March, 1903. *Not printed.*

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No. 54.. Report of the Commercial Work of the Canadian Section of the Imperial Institute, during the year 1902. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 55.. Copy of Order-in-Council with respect to Regulations under the Succession Duties Act. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 56. Copies of Orders in-Council *in re* recommendations of the Education Department. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 57.. Copy of Order-in-Council, respecting Specialist's Courses in the University of Kingston. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 58.. Copy of Order-in-Council as to agreement with the Canada Publishing Company, Limited; the Copp, Clark Company, Limited, and the W. J. Gage Company, Limited, regarding the Public School Phonic Primer. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 59.. Copy of Order-in-Council as to agreement with the Hunter Rose Company, Limited, respecting High School Euclid. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 60.. Copy of Order-in-Council *in re* Regulations governing Public Schools. Presented to the Legislature, 21st, 1903. *Printed.*

No. 61.. Copy of Order-in-Council as to agreement, amending a certain agreement with the George N. Morang Company, Limited, respecting publication of a first book of Geography. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 62.. Copy of Order-in-Council as to agreements with the George N. Morang Company, Limited, respecting certain school books. Presented to the Legislature, 21st March, 1903. *Not printed.*

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No. 63.. Copy of an Order-in-Council *in re* Regulations pertaining to School Libraries. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 64.. Statement as to the distribution of the Revised and Sessional Statutes, 1898-1902. Presented to the Legislature, 21st March, 1903. *Not printed.*

No. 65.. Report of the Master of Titles in respect to the working of the Land Titles system, in the Province, during the years 1900, 1901 and 1902. Presented to the Legislature, 23rd March, 1903. *Printed.*

No. 66.. Agreement between His Majesty, represented by the Commissioner of Crown Lands, and the Rainy Lake Pulp and Paper Company, Limited. Presented to the Legislature, 19th May, 1903. *Printed.*

No. 67.. Return to an Order of the House of the twenty-third day of April, 1903, for a Return showing account in detail of timber dues paid or owing to the Province in respect of timber cut upon Crown lands in the Townships of Elzevir and Grimsthorpe in the season of 1901-2. Also, shewing amount due to the said municipalities during same period. Presented to the Legislature, 30th March, 1903. Mr. *Pearce. Not printed.*

No. 68.. Report of the Ontario Historical Society, 1901, 1902. Presented to the Legislature, 1st May, 1904. *Not printed.*

No. 69.. By-law No. 16, under the University Act *in re* Faculty of Medicine as to expenditure of $50,000 towards completion of Building. Presented to the Legislature, 6th May, 1903. *Not printed.*

No. 70.. Statement of fees received by the Master of Titles during the years 1900, 1901 and 1902. Presented to the Legislature, 8th May, 1903. *Not printed.*

No. 71.. Return to an Order of the House of the twenty-fourth day of April, 1903, for a Return from the Office of the Master of Titles, shewing 1. Total number of Certificates issued. 2. Number of registrations for the past three years. 3. Fees received in all offices for the past three years. 4. Expenses. 5. Total amount received from the Guarantee Fund in the different offices during the past three years. 6. Total amount received from the Guarantee Fund since the same went into operation. 7. Losses and all other charges against the Guarantee Fund. 8. Total amount standing to the credit of the Guarantee Fund. Presented to the Legislature, 8th May, 1903. Mr. *St. John. Not printed.*

No. 72.. Return to an Order of the House of the fourth day of May, 1903, for a Return shewing the number of young Boys and Girls committed to the County Gaols of the Province during the years 1900, 1901 and 1902 respectively. Presented to the Legislature, 11th May, 1903. Mr. *Hoyle. Not printed.*

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No. 73.. Return to an Address of the eighth day of May, 1903, to His Honour the Lieutenant-Governor praying that he will cause to be laid before this House a Return of copies of all Awards made by the Arbitrators between the Dominion and the Provinces, since the date of the last Return. Also, a statement of the Account between Ontario and the Dominion from 31st December, 1892, to 31st December, 1902, as settled by the Counsel for the Province and the Dominion. Together with copies of correspondence between the Minister of Finance of the Dominion and the Provincial Treasurer of Ontario. Presented to the Legislature, 14th May, 1903. Mr. *Matheson. Printed.*

No. 74.. Return to an Order of the House of the Eleventh day of May, 1903, for a Return of copies of all correspondence, agreements and other documents, relating to any application, or agreement between the Government and the Toronto and Niagara Power Company, or any other person, or persons, since the first day of January, 1902, for a grant, or proposed grant of water power from the Niagara or Welland Rivers, for the purpose of generating pneumatic, or other power. Presented to the Legislature, 21st May, 1903. Mr. *Foy. Not printed.*

No. 75.. Return to an Order of the House of the Twentieth day of May, 1903, for a Return of copies of all correspondence between the Department of Public Works, or any officer thereof, and any applicant or applicants, for fishing rights or fishing concessions for commercial purposes, in Lakes Nepigon, Manitou and other Lakes in Ontario, since the first day of May, 1902, together with copies of all agreements for fishing rights, or fishing concessions, since said date. Presented to the Legislature, 28th May, 1903. Mr. *Hendrie Not printed.*

No. 76.. Return to an Order of the House of the Twentieth day of May, 1903, for a Return of copies of all correspondence, papers and documents relating in any way to the appointment of one John McMaster, in or about the month of May, 1902, as overseer of work to be performed on Markstay and Warren Road in Algoma or Nipissing, and to the work done, security given and money advanced or expended in connection therewith. Presented to the Legislature, 28th May, 1903. Mr. *Nesbitt. Not printed.*

No. 77.. Return to an Order of the House of the twenty-seventh day of May, 1903, for a Return shewing the amount of money annually expended by the Province under the "Mines Act," for the encouragement of iron mining. The names of the persons, companies or firms to whom the money has been paid. The amount of iron ore annually mined and smelted in the Province; shewing as well the amount of foreign ore annually smelted in the Province. Presented to the Legislature, 29th May, 1903. Mr. *Hoyle. Not printed.*

No. 78.. Copy of Order in Council approved by His Honour the Lieutenant Governor, on the eleventh day of June, 1902, respecting a certain

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Agreement with the Sturgeon Falls Pulp Company, Limited. Presented to the Legislature, 1st June, 1903. *Printed.*

No. 79.. Copy of an Agreement bearing date of the seventh day of May, 1903, by and between the Sturgeon Falls Pulp Company, Limited, and the Imperial Paper Mills of Canada, Limited. Presented to the Legislature, 1st June, 1903. *Printed.*

No. 80.. Return to an Order of the House of the fourth day of June, 1903, for a Return of copies of all correspondence between the Attorney-General or any other Member of the Government and the County Council of Frontenac, with reference to a Resolution of the County Council asking for the dismissal of the Sheriff of the County; together with copies of all correspondence between the Government, or any Member thereof, and James Dunkin Thompson, Registrar of the County of Frontenac, and Thomas Dawson, Sheriff of the said County, as to the appointment of a Returning Officer for the County, at the last Provincial Election. Presented to the Legislature, 16th June, 1903. Mr. *Gallagher. Not printed.*

No. 81.. Return to an Order of the House of the twenty-eighth day of May, 1903, for a Return of Copies of all correspondence between any Member of the Government and James A. Browning of Bellingham, Ontario, relating to the imprisonment of the latter, on a charge of obtaining property on false pretences. Presented to the Legislature, 26th June, 1903. Mr. *Smyth. Not printed.*

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TWENTY-EIGHTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF

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1903.

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THE ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

GUELPH, ONT.

HON. JOHN DRYDEN, Minister of Agriculture,
Toronto, Ont.

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TWENTY-EIGHTH ANNUAL REPORT

OF THE

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

FOR THE YEAR 1902.

GUELPH, December 31st, 1902.

To the Honorable JOHN DRYDEN,
Minister of Agriculture:

SIR,—I have the honor to transmit herewith the Twenty-eighth Annual Report of the Ontario Agricultural College and Experimental Farm.

In this Report the work of the year 1902 has been briefly reviewed under the following heads:

PART I. REPORT OF PRESIDENT.
PART II. REPORT OF DEAN OF RESIDENCE.
PART III. REPORT OF PROFESSOR OF PHYSICS AND LECTURER IN ENGLISH.
PART IV. REPORT OF PROFESSOR OF BIOLOGY AND GEOLOGY.
PART V. REPORT OF ASSOCIATE PROFESSOR OF BIOLOGY.
PART VI. REPORT OF PROFESSOR OF CHEMISTRY.
PART VII. REPORT OF ASSOCIATE PROFESSOR OF CHEMISTRY.
PART VIII. REPORT OF PROFESSOR OF VETERINARY SCIENCE.
PART IX. REPORT OF PROFESSOR OF DAIRY HUSBANDRY.
PART X. REPORT OF PROFESSOR OF AGRICULTURE AND FARM SUPERINTENDENT.
PART XI. REPORT OF PROFESSOR OF HORTICULTURE.
PART XII. REPORT OF PROFESSOR OF BACTERIOLOGY.
PART XIII. REPORT OF EXPERIMENTALIST.
PART XIV. REPORT OF MANAGER OF POULTRY DEPARTMENT.
PART XV. REPORT OF LECTURER ON APICULTURE.
PART XVI. REPORT OF LIBRARIAN.
PART XVII. REPORT OF THE PHYSICIAN.

I have the honor to be, Sir,

Your obedient servant,

JAMES MILLS,
President.

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PART I.

REPORT OF THE PRESIDENT.

Improved Condition of Ontario Farmers.

The condition and prospects of agriculturists in this country are improving. The farmers of Ontario, not to speak of the other Provinces of the Dominion, are in a much better position now than they were in fifteen or sixteen years ago: they are on a higher plane of intelligence; they dress better and live better,—they are getting a larger share of the necessaries and comforts of life for their labor; and as a class they stand higher socially than they did in the years gone by. Many agencies have been contributing to these gratifying results,—the Public and High Schools all over the Province, the Agricultural College, the Dairy Schools, Travelling Dairies, Farmers' Institutes, Women's Institutes, Live Stock, Dairy, and Poultry Associations, Entomological Society and Fruit Growers' Association, Winter Fairs, other great fairs, provincial sales of live stock, and the annual distribution by the Minister of Agriculture to all members of Farmers' Institutes throughout the Province free copies of all reports and bulletins issued by the Department of Agriculture, the Agricultural College, the Farmers' Institutes, and the various associations under the control of the Minister—many agencies and a great work.

Manual Training, Household Science, and Nature Study.

By the help of Sir W. C. Macdonald of Montreal, the Minister of Education for Ontario, Prof. J. W. Robertson of Ottawa, Mrs. John Hoodless of Hamilton, and other less prominent workers, a distinct step in advance has been taken along the line of adapting our primary and secondary education to what are likely to be the functions and environment (the life work and surroundings) of the great majority of our young people—manual training for boys, household science for girls, and nature study for both. Manual training and household, or domestic, science departments are in successful operation at a number of our High and Public Schools; household science is taught in the Ontario Normal School of Domestic Science and Art, Hamilton, and in the Provincial Normal Schools and Normal College; and we hope soon to offer at the Macdonald Institute in connection with the Ontario Agricultural College a valuable course in nature study and a broader, longer, and more thorough course in household science than can be given at the Normal Schools or Normal College. This course, it is expected, will begin about the middle of September next; and as special provision will be made for farmers' daughters in Macdonald Hall (or the Women's Residence) along side of the Institute, it is hoped that much will be done towards improving the management, increasing the comfort, and multiplying the happiness of Canadian farm homes. If this is done, the standard of work and citizenship throughout the Province and Dominion will rise from year to year.

College Work and Progress.

The work in the various departments of the College has gone on pretty much as usual during the past year. The class-room and laboratory work has been heavier than formerly on account of the increased attendance

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of students. Ten or eleven bulletins have been published during the year, and a considerable addition has been made to our buildings and appliances for practical work. The bulletins prepared and sent to the Department of Agriculture for publication in 1902 were as follows :

No. 117—"Pasteurization of Milk for Buttermaking" by H. H. Dean and F. C. Harrison.

No. 118—"Yeast and Its Household Use" by F. C. Harrison.

No. 119—"Ventilation of Farm Stables and Dwellings" by J. B. Reynolds.

No. 120—"Bitter Milk and Cheese" by F. C. Harrison.

No. 121—"Ripening of Cheese in Cold Storage Compared with Ripening in the Ordinary Curing Room" by H. H. Dean, F. C. Harrison, and R. Harcourt.

No. 122—"Spray Calendar—Directions for Treatment of Insect Pests and Plant Diseases" by W. Lochhead.

No. 123—"Cold Storage of Fruit" by J. B. Reynolds and H. L. Hutt.

No. 124—"Nature Study, or Stories in Agriculture" by members of the College Staff.

No. 125—"Roup" by F. C. Harrison and Dr. H. Streit.

No. 126.—"Peas and the Pea-Weevil" by C. A. Zavitz and W. Lochhead.

No. 127.—"Poultry and Poultry Raising" by W. R. Graham.

The buildings erected or completed during the year are the following: the Massey Hall and Library,—a fine brick building furnishing a students' hall, a large reading-room, a newspaper room, a stack-room for 80,000 volumes, a librarian's room, two seminary rooms, and six living rooms for Fellows; the Biological Building,—a large, plain brick structure containing a fair-sized museum, class-rooms for the Physical and Biological Departments, laboratories for general physics and soil physics, and for the different branches of study and investigation in biology—in botany, zoology, entomology, and plant and animal physiology—all well furnished and suitably equipped for instruction and practical work; a fine Live Stock Pavilion for studying and judging horses, cattle, sheep, and swine,—circular in form, 73 feet in diameter, with galleried seats around the wall and ample space in the centre for the animals brought in to be examined and judged: and a coal house, constructed underground beside the boiler house and arranged so that cars of coal can be run over it and the coal dropped through trap doors in a water-tight, cement roof.

Short Courses.

Two short courses were arranged for in the fall of 1901,—one in Live Stock and Grain Judging, to commence on January 8th, 1902, and last for two weeks; and another in Poultry Raising, to commence on January 10th and last four weeks.

No fees were charged for these courses and no examinations were required either at the beginning or at the end, the object being to assist farmers, young and old, who cannot spare the time to attend College in the usual way.

The instruction in both courses was given by our own professors, assisted by the Minister of Agriculture and a few other leading stockmen and poultrymen from different parts of the Province.

The attendance of students in the Poultry Course was 28,—all that we could handle; and the number in the stock-judging course was 220,—

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110 more than we could accommodate in our Live Stock Class-room ; so we had to divide the class and repeat the course.

The classes in both courses were composed chiefly of young men; but in the Stock Judging Course there was a considerable number of men over fifty years of age. They were all very much interested in the work ; and the short courses of 1902 were an undoubted success from beginning to end.

Students in Attendance in 1902.

The total number of students registered for work at the College in 1902, was 290 in the General Course, 109 in the Dairy Courses, 25 Specialists, 220 in the Short Course in Stock and Grain Judging, 28 in the Short Course in Poultry Raising, and 96 in the Special Course in Domestic Science,—making a net total of 768 in all courses.

The rooms in the College Residence are reserved, so far as they may be required for Ontario students in the General Course. Ontario students pay $20 a year tuition fee, unless they have been nominated by County Councils to attend as county representatives, in which case they are admitted without payment of fees. A student from any place outside of the Province pays $50 a year tuition fee.

Analysis of College Roll (General Course, 1902.)

1. From Ontario.

Brant	9	Kent	1	Prescott	2
Bruce	7	Lambton	5	Prince Edward	3
Carleton	5	Lanark	4	Rainy River	1
Dufferin	9	Leeds	8	Renfrew	2
Dundas	6	Lennox	2	Russell	3
Durham	3	Lincoln	9	Simcoe	9
Elgin	10	Middlesex	4	Stormont	2
Essex	3	Muskoka	1	Victoria	1
Frontenac	1	Norfolk	2	Waterloo	5
Grenville	2	Northumberland	2	Welland	2
Glengarry	2	Ontario	6	Wellington	11
Grey	7	Oxford	6	Wentworth	12
Halton	4	Parry Sound	1	York	13
Hastings	7	Peel	2	Toronto	14
Huron	8	Perth	5		
					216

From other Provinces of the Dominion.

British Columbia	2	Nova Scotia	9	Assiniboia	2
Manitoba	2	Prince Edward Island	1		
New Brunswick	6	Quebec	13		35

From other Countries.

England	7	United States	4	Sweden	1
Jamaica	5	Argentine Republic	17	Uruguay	1
Scotland	1	Asia Minor	1		
Mauritius	1	India	1		39

Total in General Course 290
Total in General Course and Dairy Courses 399

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Ages and Religious Denominations.

The limits of age of students in the General Course, 1902, were nearly the same as in 1901, ranging from 16 to 38 years. The average was 20.

The religious denominations were represented as follows in 1902:

General Course,—91 Presbyterians, 85 Methodists, 48 Episcopalians, 23 Roman Catholics, 18 Baptists, 4 Congregationalists, 4 Disciples, 3 United Brethren, 2 Christadelphians, 2 Friends, 2 Lutherans, 2 Mennonites, 2 New Jerusalemites, 1 Christian Association, 1 Evangelical Association, 1 Greek Orthodox, 1 Plymouth Brother.—290.

Dairy Courses.—33 Methodists, 33 Presbyterians, 14 Episcopalians, 14 Roman Catholics, 5 Baptists, 5 Congregationalists, 2 Christians, 1 Christadelphian, 1 Disciple, and 1 United Brethren.—109.

Counties Represented in 1902.

It will be noticed in the College Roll that 44 Ontario counties and districts were represented in the General Course in 1902. There were 13 from York, 12 from Wentworth, 11 from Wellington, 10 from Elgin, 9 each from Brant, Dufferin, Lincoln, and Simcoe, 8 from Huron, 7 each from Bruce, Grey, and Hastings, 6 each from Dundas, Ontario, and Oxford, 5 each from Carleton, Lambton, Perth, and Waterloo, and smaller numbers from other counties.

County Nominations.

By Legislative enactment, each county council of the Province has power to send one student to the College free of tuition. Of those on the roll in 1902, 66 were nominated by county councils, and hence were exempt from the payment of tuition fees. The counties and districts which exercised the power of nomination during the year (44 in number), were the following: Addington, Algoma, Brant, Bruce, Carleton, Dufferin, Dundas, Durham, Elgin, Essex, Frontenac, Glengarry, Grenville, Grey, Halton, Hastings, Huron, Kent, Lambton, Lanark, Leeds, Lennox, Lincoln, Middlesex, Norfolk, Northumberland, Ontario, Oxford, Parry Sound, Peel, Perth, Peterborough, Prescott, Prince Edward, Renfrew, Russell, Simcoe, Stormont, Victoria, Waterloo, Welland, Wellington, Wentworth, and York.

Our Courses of Study.

About two years ago there were some criticisms of our courses of study by a couple of writers in one of our agricultural journals and by a friend or two who spoke to me about the matter, suggesting or maintaining—

One, that an Agricultural College should confine its attention, exclusively or almost exclusively, to short and strictly practical courses in agriculture, dairying, etc., endeavoring to teach the leading principles of soil physics, agricultural chemistry, economic botany, agricultural and dairy bacteriology, agricultural and horticultural entomology, and general veterinary practice,—without any preliminary study of the fundamental laws and principles of physics, chemistry, etc., as a preparation for the application of these principles to various practical purposes, an introductory talk or two on any science being quite sufficient to prepare agricultural students for lectures on the applications of that science to agriculture in one or other of its various branches.

Another, that a two years' course, as we have it at Guelph, for work and life on the farm, is not too long nor too scientific, but that less time

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should be spent on the details of certain branches, such as geology, zoology, and veterinary anatomy and materia medica, in order to leave more time for such practical subjects as agriculture, horticulture, live stock, dairy husbandry, and horse judging and breeding.

A third, that the two years' course is all right, and should be left as it is, but that it is a mistake to require mathematics, English, and French or German, of those who take the four years' course for the B.S.A. degree.

Now, as these criticisms were honestly made by well-disposed people, I feel that as President of the College I should state briefly our reasons for prescribing the courses of study which we now offer, and refusing to make radical changes.

In our last circular, the reader will see that we have

I. A Two Years' Course,—known as the Associate Course, leading to the Associate Diploma.

Intended specially for work and life on the farm.

This Course includes lectures, laboratory work, and manual labor. The subjects embraced in the course are—

English,—grammar, composition, and selections of literature.

Economics,—a short, elementary course.

Mathematics,—arithmetic, mensuration, mechanics, and book-keeping.

Natural Science,—physics, chemistry, geology, botany, zoology, entomology, and bacteriology.

Veterinary Science,—a short course, with emphasis on "practical horse."

Agriculture,—Agronomy and animal husbandry, with emphasis and a good deal of time.

Dairying,—milk-testing and butter-making, with less attention to cheese-making.

Horticulture,—vegetables, fruit, flowers, and landscape gardening.

Forestry,—a short, popular course.

II. A Three Years' Course, leading to a Specialist Certificate in Agriculture or Horticulture.

For Associates who reach a specified rank in English, agricultural physics, agricultural chemistry, economic botany, economic entomology, agriculture, horticulture, and dairying, and wish to specialize for a year in the theory and practice of Agriculture or Horticulture.

III. A Four Years' Course, leading to the B.S.A. degree. For Associates who

(1) have passed the Provincial University Matriculation Examination.

(2) have taken rank in the Associate Course satisfactory to the College staff, say, 50 per cent. of the marks in English and 60 per cent. in general proficiency.

(3) wish to obtain the B. S. A. degree.

A third year, to study French or German, acquire greater proficiency in the use of English, and get a broader and deeper knowledge of the sciences relating to agriculture.

A fourth year, devoted to English, French or German, and one of the following options: Agriculture; Dairying; Horticulture; Biology; Bacteriology; Physics; and Chemistry.

IV. Short courses—

(1) A two weeks' course in Live Stock and Grain Judging.

(2) A three weeks' course in Butter-making.

(3) A four weeks' course in Poultry Raising.

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(4) A three months' course in Dairying,—Milk-testing, Butter-making, and Cheese-making.
(5) Practical courses of any length at any time in Home Dairy work.

Note 1.

Our aim is to make the Two Years' Course thoroughly practical, in the true sense,—not by proceeding at once, as suggested by one of our critics, to use terms and apply principles which have not been learned, but by laying in the first year as simply and concisely as possible a solid foundation of scientific principles, and in the second year applying these principles to the solution of problems which arise in practice on the farm.

We spend some time on English in this course, not from choice, but because the early education of many of our best boys has been neglected, and we wish, if possible, to fit them for taking their place in the affairs of Church and State as well as for doing better work on the farms of the Province.

We have from ninety to a hundred boys a year entering for two years or a longer period; and while this is so, we think it would be a great mistake to substitute for our well established Two Years' Course a short, so-called practical course such as that proposed by our critic, proceeding at once to give lectures on agricultural chemistry, farm botany, dairy bacteriology, and other subjects, with the most meagre and fragmentary knowledge of scientific principles to build upon. Such a short course is, no doubt, the best thing for a College that cannot get any considerable number of students for longer and more thorough courses, but not for Colleges that have large classes willing to spend the time necessary to do broader-based and better work on the same lines.

Further, if we should adopt the more superficial short course method in the scientific subjects, it would not serve as a foundation for any of the longer courses, in case short course students should (as they often do) return for one of the courses leading to a diploma, certificate, or degree.

Real education, even a strictly practical education, of the kind farmers need to raise them above the level of mere hewers of wood and drawers of water for the other classes, cannot be got in the rush of a short course, however valuable such a course may be for certain persons and specific purposes. Hence we have decided to continue our regular Two Years' Course leading to the Associate Diploma; but we do not hesitate to admit, with one of our critics, that it may be advisable, in this course, to spend less time on technical details in two or three subjects, in order to get the time necessary for broader and more thorough work in some other subjects that have a more direct bearing on a farmer's every-day duties in after life.

Note 2.

Most of our students, in fact the great majority, take the Two Years' Course and return to the farm; and we have raised the bars fairly high —requiring Provincial University Matriculation, mathematics, English, French, German, etc.—at the entrance to the two additional years required for the B. S. A. degree, in order that students may not be diverted from the farm in the hope of positions of a professional or semi-professional character, as would be the case if the additional work required for a degree in agriculture were made too easy.

The Two Years' Course, leading to an Associate Diploma, is thoroughly practical and not too difficult. The Four Years' Course, leading to the B. S. A. degree, is also practical, but is guarded by higher entrance requirements and made so difficult that none but a few of the best Associates are

allowed to undertake the two years' additional work prescribed under this head.

It will be noticed that the Short Courses which we offer are all of such a character that they can be pursued without much if any preliminary scientific training. Hence they are not open to the objection which may properly be urged against short courses that involve a knowledge of the fundamental principles of physics, chemistry, botany, bacteriology, and other scientific subjects,—a knowledge required but not furnished either before or during the course.

Department Reports.

The members of our staff nearly all perform the double functions of instructors and investigators, teaching and doing more or less original work; and my practice has been to present in a few words the substance of the results obtained from the experimental work in each department; but this year, being hard pressed for time on account of a multiplicity of duties, I must deny myself the pleasure of doing so, and refer the reader direct to the different reports which follow under sixteen heads.

The Macdonald Buildings.

As many questions are being asked about the Macdonald Buildings and the course or courses of study which we propose to offer to women who may come here for Household Science or other subjects, I should, I presume, devote a paragraph to the subject.

The site for the Macdonald Buildings is a high, dry, and beautifully located plot of about twelve acres immediately north of the College Campus, from which it is separated by a public road, along which the Guelph Street Railway runs, forming a loop round the College grounds. From all parts of this beautiful site there are splendid views of the City of Guelph, of the country away southwest, and for four or five miles over the valley traversed by the Grand Trunk in the northeast. There will also be a good view of the College grounds as soon as a little pruning of trees is done.

As already stated, two buildings will be erected on this site during the coming summer,—the Macdonald Institute, for instruction and practical training in Nature Study, Manual Training, and Household Science,—including cooking, plain sewing and mending, dressmaking, millinery, laundry work, and general housekeeping; and close by it a large building to be known as Macdonald Hall, which will be a Residence for 100 women, something similar to our boys' Residence, but better planned and furnished.

About a year ago, Sir W. C. Macdonald, of Montreal, gave us $125,000 for the erection and furnishing of these buildings; and we intended to proceed with the work at once; but we had not gone far till we discovered that the cost of building had increased to such an extent that even $125,000 was not sufficient to provide the buildings that seemed necessary to accomplish the objects for which the money had been given. We drew plan after plan, making changes, alterations, and reductions, till at length we gave up in despair and had to lay the whole matter before Sir William,—when, to our surprise and delight, he at once added $50,000 to his magnificent bequest of a year ago, making a total of $175,000. The plans were then completed, the contracts for the buildings were let, and the work will proceed the moment the frost is out of the ground.

Water mains and fire hydrants have to be put in; an electric line has to be taken over from the College; the ground has to be graded, roads made,

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and cement walks laid—many, very many things have to be done, and the time is very short; but we hope to have the buildings furnished and ready for use by the 13th of September next.

We are now working on the courses of study and intend to issue an announcement early in the summer, giving such information as intending applicants for admission may require. All I can say at present is that we shall offer a fixed course for teachers and two or three courses for farmers' daughters, allowing considerable latitude in the choice of subjects, as Sir William Macdonald wishes us to do all that, under the circumstances, can be done to assist young women from the farms of the country in their efforts to master the difficult but all important art of home-making.

Farmers' Excursions.

Last summer we had rather more than the usual number of excursionists under the auspices of the Farmers' Institutes,—something over 30,000. Most of them were farmers, and their wives, and sons, and daughters. They had been here before; and they came again, not so much for an outing or mere amusement, as in the hope of learning something that would assist them in the management of their own farms.

Class-room Work.

The class-room work in the different departments of the College course has gone on as usual. A fair proportion of first and second year students gained a respectable standing in our College examinations; but the percentage of failures is still large, resulting in some cases from idleness, but in most instances from a lack of early training in the elementary branches of an English education.

The fourth year examinations were conducted by examiners appointed by the Senate of the University of Toronto; and those of the first, second, and third years by the professors and instructors of the College.

Bachelors of the Science of Agriculture.

The examinations for the degree of B. S. A. were held in the month of May, and the successful candidates received their degrees at the commencement exercises of the University in June. The list was as follows :

Black, W. J. ..... Stanton, Dufferin, Ont.
Carson, W. J. ..... Vernon, Russell, Ont.
Christie, G. I. ..... Winchester, Dundas, Ont.
Hallman, E. C. ..... Washington, Waterloo, Ont.
Jacobs, F. S. ..... Minesing, Simcoe, Ont.
Moorhouse, L. A. ..... Cairo, Lambton, Ont.
Murray, J. ..... Avening, Simcoe, Ont.
*Waters, B. J.** ..... Ivan, Middlesex, Ont.

*To take supplemental examination in Bacteriology.

Recipients of Associate Diplomas.

Barber, T. C. ..... Yorkton, Assa.
Barton, H. ..... Vankleek Hill, Prescott, Ont.
Bray, C. I. ..... Kleinburg, York, Ont.
Buchanan, D. ..... Florence, Lambton, Ont.

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Bustamante, R. S. ..... Jujuy, Argentine Republic.
Clarkson, F. L. ..... Sweaborg, Oxford, Ont.
Coglon, M. F. ..... Bath, Lennox, Ont.
Colter, G. L ..... Mouth of Keswick, N. B.
De Coriolis, E. G. ..... Forest Side, Mauritius.
Dewar, W. R. ..... Fruitland, Wentworth, Ont.
Downing, R. J. ..... Fenaghvale, Prescott, Ont.
Duff, W. E ..... Stirton, Wellington, Ont.
Dysart, A. A. ..... Cocagne, N. B.
Elliott, G. W. ..... Cathcart, Brant, Ont.
Fulmer, H. L. ..... Ruthven, Essex, Ont.
Gunn, R. E. ..... Toronto, Ont.
Hamilton, W. ..... Ravenshoe, York, Ont.
Henderson, T. B. R. ..... Rockton, Wentworth, Ont.
Houser, H. W. ..... Campden, Lincoln, Ont.
Irvine, A. ..... Habermehl, Grey, Ont.
Johnston, J. ..... Fingal, Elgin, Ont.
Laird, J. O. ..... Blenheim, Kent, Ont.
Metcalfe, I. F. ..... Burford, Brant, Ont.
McCallum, J. M. ..... Shakespeare, Perth, Ont.
Morton, W ..... Bethany, Durham, Ont.
McNaughton, F. B. ..... Balderson, Lanark, Ont.
Panelo, J. ..... Buenos Aires, Argentine Republic.
Paul, R. H. ..... Bath, Lennox, Ont.
Peltzer, J. ..... Buenos Aires, Argentine Republic.
Readey, J. C. ..... Rosetta, Lanark, Ont.
Reynolds, R. H. ..... Scarboro' Junction, York, Ont.
Rothwell G. B. ..... Ottawa, Carleton, Ont.
Shearer, F. J. ..... Vittoria, Norfolk, Ont.
Smith, R. S. ..... Toronto, Ont.
Stauffer, G. A. ..... Ringwood, York, Ont.
Strachan, C. L. ..... McKenzie, Man.
Thom, C. C. ..... Elma, Dundas, Ont.
Zavitz, C. J. ..... Fork's Road, Welland, Ont.

First-class Men.

The work of the College is divided into departments, and all candidates who obtain an aggregate of seventy-five per cent. of the marks allotted to the subjects in any department are ranked as first-class men in that department. The following list contains the names of those who gained a first-class rank in the different departments at the examinations in 1902, arranged alphabetically :

First Year.

Albright, W. D., Beamsville, Ont., in four departments,—English and Mathematics; Physical Science; Biological Science; Agriculture.
Cameron, R. R., Ailsa Craig, Ont., in one department,—English and Mathematics.
Deachman, R. J., Gorrie, Ont., in two departments,—English and Mathematics; Biological Science.
Eddy, E. D., Scotland, Ont., in one department,—English and Mathematics.
Esmond, C. W., Blessington, Ont., in one department.—English and Mathematics.

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Groh, H., Preston, Ont., in one department,—Biological Science.
Howitt, J. E., Guelph, Ont., in one department,—Biological Science.
McDonald, D. J., Crawford, Ont., in one department,—English and Mathematics.
McKillican, W. C., Vankleek Hill, Ont., in three departments,—English and Mathematis; Physical Science; Biological Science.
Pearse, S. M., Iona, Ont., in three departments,—English and Mathematics; Physical Science; Biological Science.
Reid, F. H., Georgetown, Ont., in three departments,—English and Mathematics; Physical Science; Biological Science.

SECOND YEAR.

Barton H., Vankleek Hill, Ont., in three departments,—Physical Science; Biological Science; Agriculture.
Dewar, W. R., Fruitland, Ont., in three departments,—English and Mathematics; Physical Science; Biological Science.
Fulmer, H. L., Ruthven, Ont., in two departments,—Physical Science; Biological Science.
Houser, H. W., Campden, Ont., in four departments,—English and Mathematics; Physical Science; Biological Science; Agriculture.
Laird, J. O., Blenheim, Ont., in two departments,—English and Mathematics; Biological Science.
McCallum, J. M., Shakespeare, Ont., in four departments,—English and Mathematics; Physical Science; Biological Science; Agriculture.
Readey, J. C., Rosetta, Ont., in four departments,—English and Mathematics; Physical Science; Biological Science; Agriculture.
Thom, C. C., Elma, Ont., in one department,—Biological Science.

SCHOLARSHIPS.

Scholarships of $20 each in money were awarded for groups of subjects in first year work, as follows :

Highest standing, with a minimum of forty per cent. of the marks for each subject, and an aggregate of seventy-five per cent. of the total number of marks allotted to the subjects in the group—

I. English, Mathematics, Book-keeping, and Drawing.—S. M. Pearce.
II. Physics, Chemistry, and Geology.—F. H. Reed.
III. Botany, Zoology, and Horticulture,—W. C. McKillican.
IV. Agriculture, Dairying, Poultry, Apiculture, and Veterinary Science, —W. D. Albright.

Prizes.

Prizes were given as follows :

Essay on "Addison, Macaulay, and Carlyle as writers of English Prose". —$10 in books to H. W. Houser, Campden, Lincoln, Ont.

First place in general proficiency on first and second year, theory and practice.—$10 in books to H. W. Houser, Campden, Lincoln, Ont.

Governor General's Silver Medal.

Highest in general proficiency, second year, 1901-1902.—H. W. Houser, Campden, Lincoln, Ont.

THANKS AND FURTHER REQUESTS.

I wish most sincerely to thank the Minister of Agriculture, the other members of the Government, and the members of the Legislature for the lib-

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eral contributions which they have recently made for buildings, laboratory equipment and the employment of an efficient staff at the Ontario Agricultural College. The liberality has been marked; and the results are, I think, satisfactory to all concerned. We are doing much more and better work than in the past; the attendance of students is increasing; and the farmers, Liberal and Conservative alike, are beginning to look upon the College as distinctively and peculiarly their own institution—a place where their wants are always considered, and their questions promptly answered. They look to the College for help and leadership at every turn. Their rapidly growing confidence and support are a manifest source of strength to the College; and we can truthfully say that the liberality of the Legislature has not been in vain.

So far, well, and we are thankful; but the motto in our coat of arms is *nulla dies sine linea*, no day without a line,—progress. Always pushing ahead. No time even to congratulate ourselves. When an institution ceases to grow and develop, dry rot sets in. Hence our unyielding determination to keep forging ahead.

We now have three good laboratories, fairly well equipped,—the physical, chemical, and biological laboratories, although the chemical laboratory is not large enough for the students now in attendance, to say nothing of the extra room that will be required when lady students are admitted next fall. We have also a well equipped horticultural department; but we are much in need of a large and well appointed bacteriological laboratory and an isolation stable, with the equipment necessary for the instruction of students in the General Course, special instruction and laboratory practice for students in the Dairy Course, more advanced work for specialists in the third and fourth years of the B.S.A. Course, and an endless amount of investigation of matters pertaining to tuberculosis, anthrax, hog cholera, glanders, roup, foul brood, and other diseases of birds, bees, and farm stock.

We also need a new carpenter shop and a large shed with electric power arranged so that farm implements and machinery can be put in motion, operated, examined, and compared by students with a competent instructor in the winter months,—as is done at the Industrial Fair during the progress of the Exhibition.

These are our most urgent needs, and I submit them in the hope that they will receive favorable consideration from the Government and the new Legislature.

The financial statement on maintenance account as prepared by the College Bursar, in accordance with the estimates for 1902, will be found at the end of this volume.

Ontario Agricultural College,
Guelph, December 31st, 1902.

JAMES MILLS,
President.

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Portion of Main College Building.



Massey Hall and Library.

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Biological Building for Physics Biology and General Museum.



Sugar beet illustration,—exhibit at Industrial Fair, Toronto.
(See page 36.)

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Thinning sugar beets near Guelph.
(See page 46.)



A field of sugar beets grown for the Wiarton factory, August 25, 1902.

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Annual and Perennial Flower Borders.
(See page 77.)



A Student's Collection of House Plants.
(See page 77.)

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PART II.

DEAN OF RESIDENCE AND INSTRUCTOR IN ENGLISH.

To the President of the Ontario Agricultural College:

Sir,—I have much pleasure in submitting a brief report of my first year's work as Dean of Residence and Instructor in English.

In my capacity as Dean of Residence, it has been my duty to preside in the College dining-hall, superintend evening study, inspect the College furniture, look after repairs when necessary, and direct students as to duty and conduct.

Considering the crowded condition of the dining-hall, I think the order and decorum maintained there is good. The hall has a seating capacity of 180; and even that is far from adequate for the accommodation of the increased number of students in attendance at the present time.

The students, with but few exceptions, are strongly disposed to observe the rules and regulations regarding the study hour. The campus, gymnasium, and outside work furnish a vent by means of which an escape is afforded to the superfluous energy of youth. To these, and to the thoughtfulness of the students themselves, may be attributed, in large measure, the quiet which prevails during the study-hour. As the term wears away, I notice a marked improvement in the methods of study. Time-tables are made out, work is planned, and system prevails in the study-room. Many who at the beginning of the term were unable to read and think continuously during the study-hour, show marked signs of development in the power of application and concentration.

My class-room work first comprised lectures in English, Grammar, Composition, Mathematics, Drawing and Bookkeeping, but, with your consent, a change was made by which Prof. Reynolds took the Mathematics and Drawing, and gave me the English of the Second Year. So that now my work is largely English. In this, I have endeavored to give the students a working knowledge of the subject. The Grammar is studied with a view to learning the correct form of words, with their varied inflections, and the general laws and idioms of the language. In English Literature, both poetry and prose are taught with a view to enlarging the student's field of thought, increasing his vocabulary and means of expression, acquainting him with a few of the standard writers of English, and developing in him a love of good literature. In Composition and Rhetoric, my object has been to give the student such training as will enable him to express his thoughts in a clear, correct, and forcible manner. This has been done by dealing first with the form and structure of sentences, followed by the combining of sentences into paragraphs, and paragraphs into a connected whole. The students have had practice in the planning and writing of compositions on such topics as the following: "The Winter Fat Stock Show," "How to Beautify the Country Home," "Rural Mail Delivery," "New Ontario," "The Advantages of Good Roads in the Country," and "Education for the Farmer." Besides class work, much of my time has been given to personal work with individual students desirous of help in the correction of their compositions.

The course in Bookkeeping comprises commercial forms, business correspondence, and the keeping of farm and other accounts.

In closing, it is scarcely necessary for me to remind you that the residence is in no way adequate for the accommodation of the large number of students now attending the College.

I am respectfully,

Your obedient servant,

W. J. RUTHERFORD.

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PART III.

PROFESSOR OF PHYSICS AND LECTURER IN ENGLISH.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to present herewith my Eight Annual Report.

The Work in English.

English Literature. With regard to the work in English, it is gratifying to note that, notwithstanding the constantly increasing pressure from other subjects on the curriculum that are more immediately utilitarian, the subject of English continues to receive from the students no less attention than in former years, but rather more. It is a compliment to the ambition and the intelligence of our students to say that they exhibit an interest which is not perfunctory, in the classics of English literature. Shakespeare, Milton, Wordsworth, Tennyson, and Carlyle, Scott, Eliot, Irving, are to them not mere names, but more or less intimate acquaintances. At the same time, however, it has been found expedient to lessen the amount of work required of the classes in English Literature, in order to give an opportunity to emphasize the other branches of English.

English Composition, theoretical and practical, receives more attention in class-work than formerly. The usefulness of this branch of the work is, of course, measured and limited by the amount of time that can be spent by the students in the writing of composition and essays. We have two methods for considering this practical work in English. The papers written by students, on subjects chosen or assigned, are read by the writers in class, and criticized as to style and method by the class or the teacher. Or, the papers when written are handed to the teacher to be examined, marked and valued; they are then handed back, and the principal forms of error in composition that have occurred in these papers are written on the board for discussion in class. Of these methods, the former allows more work to be covered in class, and, therefore, has a necessary place; the latter method, however, is more effective in inculcating carefulness and correctness in composition. The progress in this branch is most encouraging. Mr. Rutherford, the Dean of Residence, has charge of the First and Second Year work in English Literature and Composition.

Public Speaking. Under the able direction of Prof. Cumming, this part of the work is making most satisfactory progress. With the classes giving instruction and practice, and with the opportunities afforded in the seminaries and in the Literary Society, every student now has the means, if he will, of advancing beyond the tyro stage in platform speaking.

Instruction in Mathematics and Physics.

Decimals, the Metric System, and Mensuration. In a course of two periods a week, with some afternoon periods, the above subjects are given to the First Year. The instruction on decimals comprises a thorough course in decimal notation, adding, multiplying, and dividing of decimals, calculating percentages by the decimal notation, with some work on annuities. With regard to the decimal notation proper, I am trying to substitute it in all problems, so far as practicable, for the fractional notation, which is clumsy, inconvenient, and out-of-date.

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The Metric System of weights and measures is at the present time a proper subject of study for all schools and colleges. The displacing of our present system of measuring, weighing, and calculating by the decimal or metric system, is only a matter of time. All intelligent persons will welcome an opportunity to understand the new and improved system.

Mensuration, or the science of measuring, is presented only in its simplest and most practical form. Rules and practice in measuring lumber, bins, cisterns, silo, and land areas, calculating the amount of material required in building, and similar questions comprise the greater part of the work in this subject. In all of these—the decimal system, metric system, and mensuration—practical work in the laboratory is part of the course.

The Physical Properties of Woods is a new subject, born of the agitation for increased instruction in Forestry. As yet, we are taking up the subject only in a small way, partly for its own sake and partly as an exercise in mensuration. We have obtained samples of Canadian building and furniture woods. These samples are in board form, being planed and squared. They are weighed in grams, and the weight, with the name of the wood, stamped on each sample. The students are required to measure the dimensions of each piece, and calculate the cubic contents and the specific gravity. In addition, they note the color, grain, and texture of each wood. This, of course, is a mere beginning in Timber Physics, but even this small amount of knowledge gained is worth the getting.

Mechanics is principally a laboratory subject, in which the First Year investigate for themselves, the simple and common forms of mechanical appliances.

Surveying is a subject for the fall term of the Second Year, and consists of a six weeks' course of lectures, of field work in measuring land areas of different shapes, and of laboratory work in plotting on paper the results of the field work. Following this is a course in General Physics, so far as it explains the movements of water and air in the soil, and afterwards a course in Soil Physics in its more practical aspects.

In order to supplement the rather defective attainments of our students in Mathematics, a course in Algebra and Euclid is given in the Third Year. The Physics for the graduate course begins with Meteorology, which is followed by Cold-storage in the Third Year, and Soil Physics in the Fourth Year.

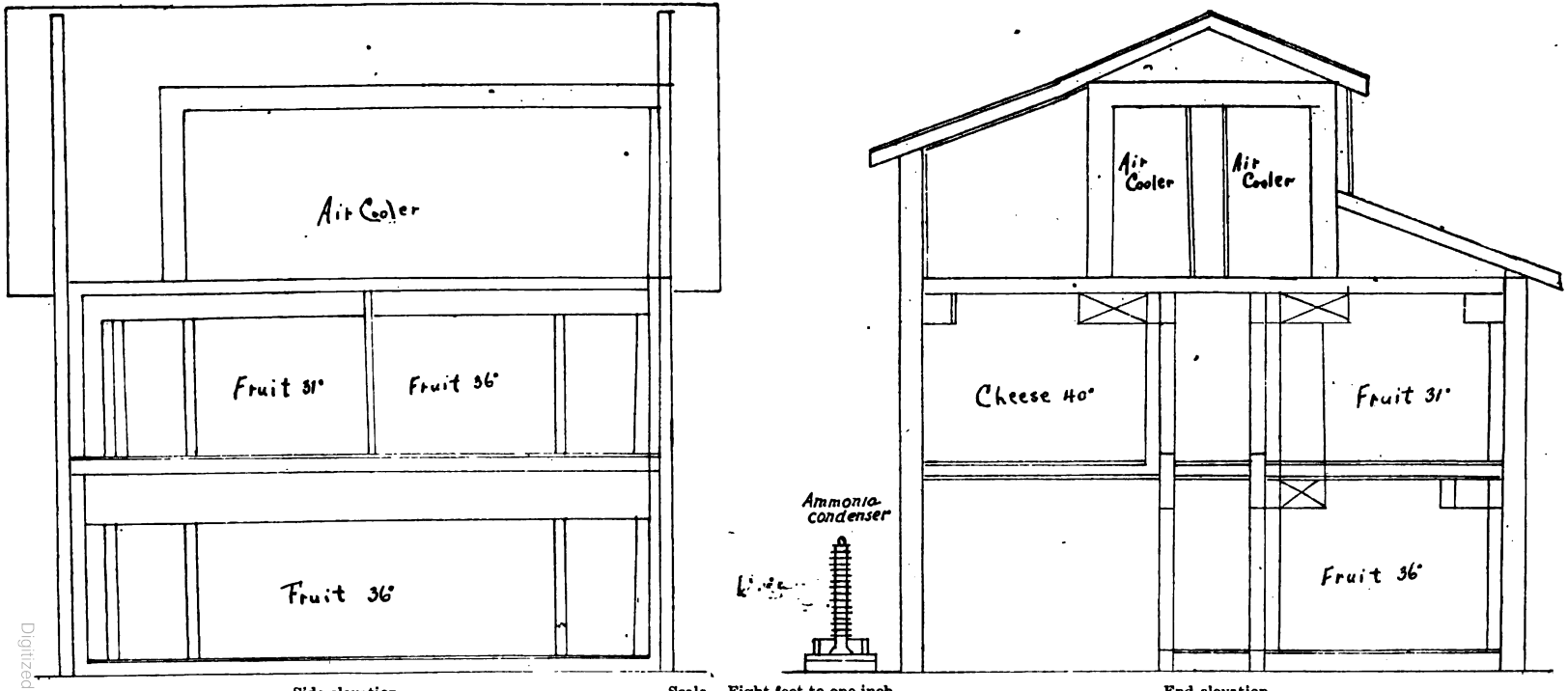
A large number of lectures are implied in the various parts of the work in English, Mathematics, and Physics. The preparation and delivery of these lectures and the supervision of the laboratory work in the four years, form my College duties.

The correspondence of this department, while not large, is constantly growing in bulk and importance. During the past year, a large number of questions have been received and replied to concerning cultivation of farm crops, qualities of soil samples submitted for examination, farm water-supply, ventilation, and cold-storage; and I take pleasure in inviting correspondence with farmers on any of these subjects.

Early in the year, Bulletin 119, on Ventilation of Farm Stables and Dwellings, was prepared by the writer and published by the Department of Agriculture. Later, Bulletin 123, on the Cold-storage of Fruit, was prepared jointly by myself and Prof. Hutt, and published also. I had the honor also, with the rest of the College staff, of being invited to take part in the preparation of a bulletin on Nature Study, or Stories in Agriculture —Bulletin 124—which has just been published.

In all of the above work, and in the investigation conducted by this

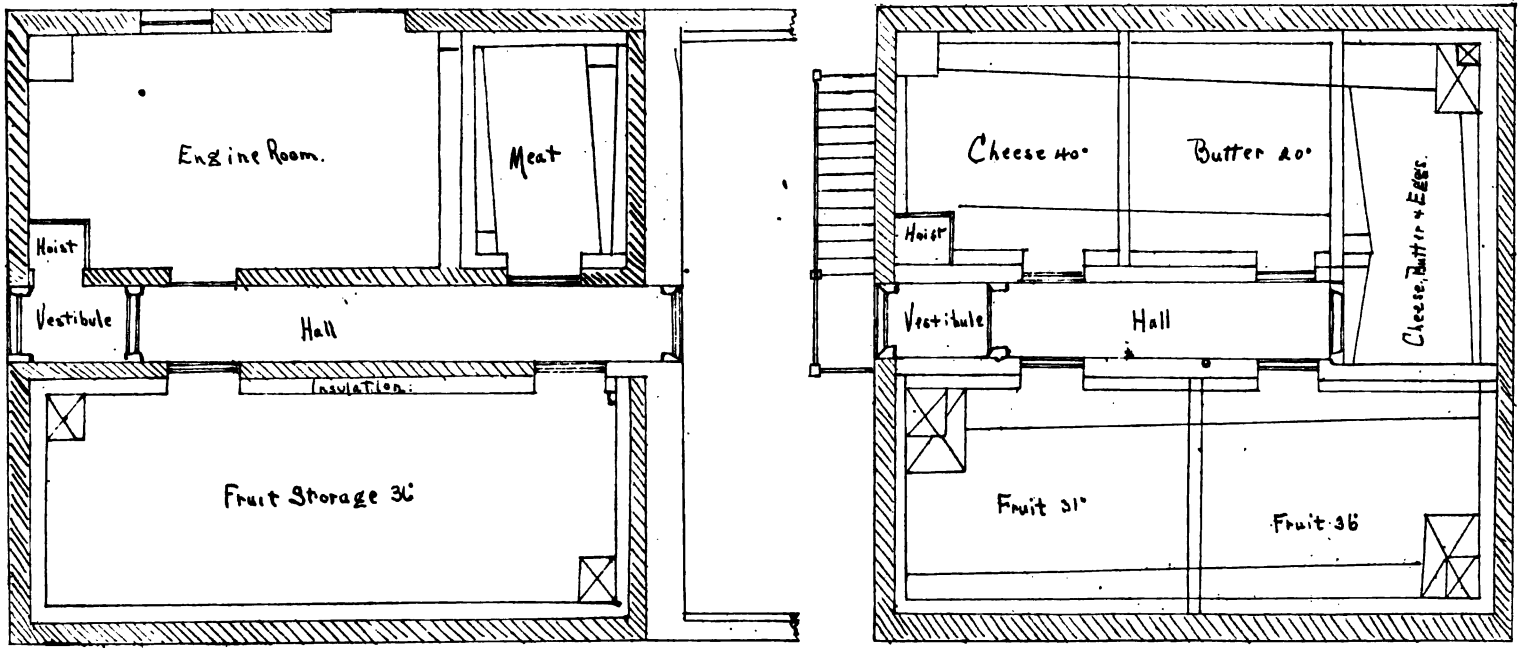
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Side elevation. Scale.—Eight feet to one inch. End elevation.

PLANS OF COLD STORAGE BUILDING, ONTARIO AGRICULTURAL COLLEGE.

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Ground floor. Scale.—Eight feet to one inch. First floor.

PLANS OF COLD STORAGE BUILDING, ONTARIO AGR CULTURAL COLLEGE.

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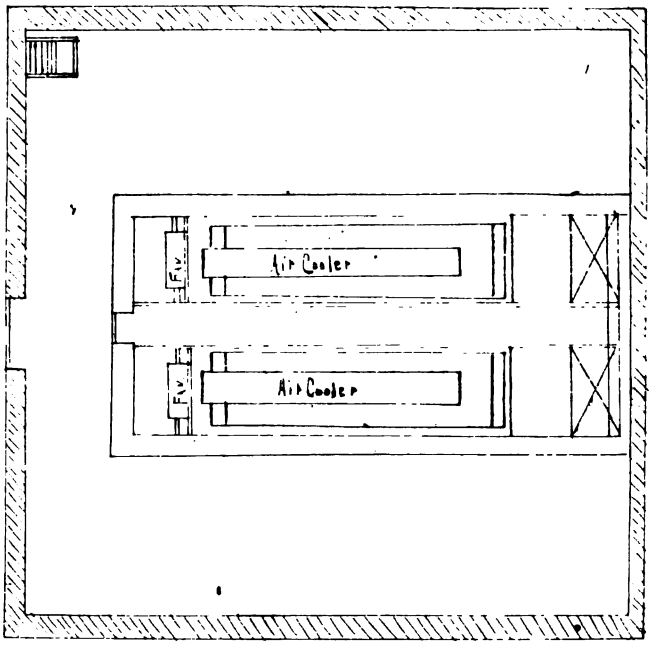
department, I had the able assistance of Mr. G. B. McCalla, Fellow in Physics. Mr. McCalla's work has been characterized by ability and faithful attention to details.

THE COLD STORAGE BUILDING.

A new Cold-Storage system is being installed at the College, principally for the purpose of experimenting on the storage of different kinds of farm produce. There are six experimental chambers in the building—three for dairy products and eggs—in which different temperatures will be maintained as required; two for fruit to be held at different temperatures; and one for the meat and poultry in which the temperature can be varied from time to time.

The building will be cooled mechanically by the method of air circulation. By a powerful compression pump, ammonia vapor is compressed and liquefied, and then the liquid ammonia is allowed to pass into coils of pipes where the pressure is reduced. In these pipes, the liquid ammonia evaporates and by its evaporation refrigerates everything in the vicinity of the expansion pipes. The expansion pipes are situated in an air chamber, and a fan drives the air over the pipes, thence through ducts into the rooms to be cooled, and then back again to the cooler.

In order to prevent indiscriminate mixing of air from cheese-rooms, butter-rooms, and fruit and vegetable-rooms, two fans and two coolers will be in operation, one for cheese and butter and the other for fruit and vegetables; and the circulating air of each system will be kept entirely separate from that of the other system.



Second Floor of Cold Storage Building.

In addition to the six experimental chambers, the building contains one room 26 x 10 for College use, and is connected with the College by means of a door, which has been cut through the wall into the store-room. There is also in the building the engine-room, containing the engine and

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compressor for working the fans. The engine-room has been made sufficently large to accommodate an ice-tank for the manufacture of artificial ice, although the tank is not being procured at the present time. The engine is driven by steam supplied from the College boilers.

The insulation of the walls consists :

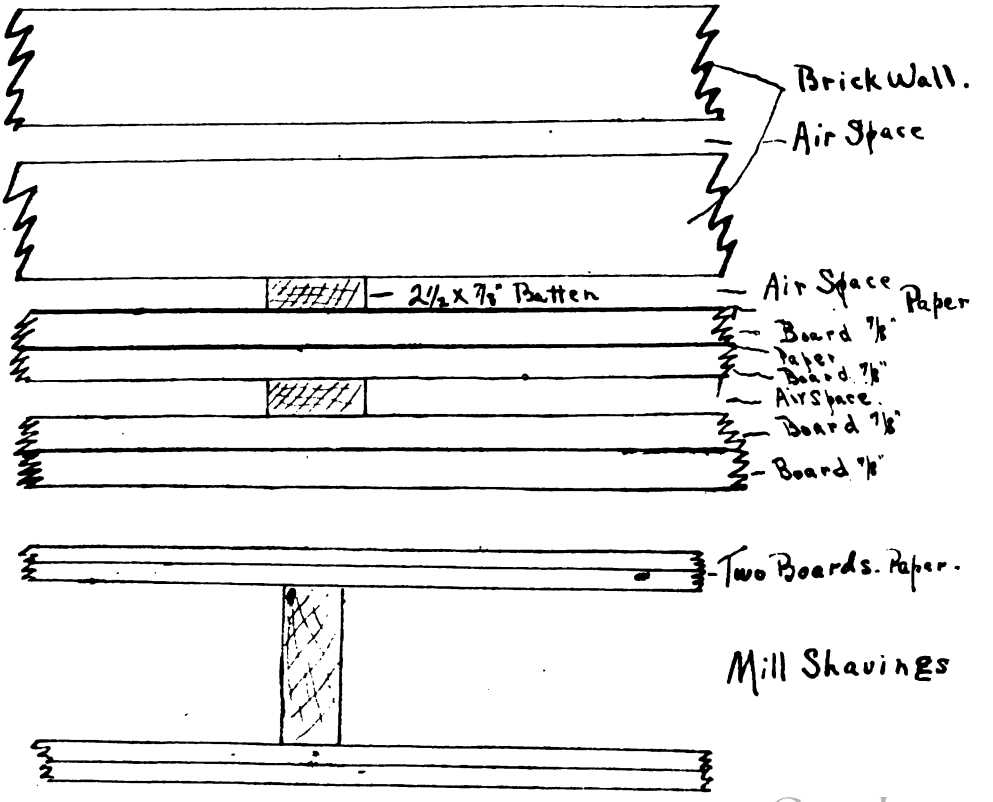
1. Of a hollow brick wall, constructed as follows: Two 4½-inch walls, with a 2½-inch space between. Across this space, at intervals of three feet, a bonding course of brick is laid all round.

2. The two inside faces of the walls are coated with a preparation of cement plaster, making each wall practically air-tight; and the top of each bonding course is also plastered, so that we have secured within the wall a series of dead-air spaces.

3. Next to the wall is strapping placed vertically, and on this is a heavy coating of insulating paper, and then lumber, paper, and lumber, making a second air-space and a course of insulation. Next comes strapping laid vertically and horizontally, in squares, then lumber, paper, and lumber, making another dead-air space with a second course of insulation.

4. The floors are insulated by two thicknesses of lumber and one thickness of paper, above and below the joists, with mill shavings between the joists. This is the style of insulation also around the cooler above the second floor.

For a better understanding of this description, I beg to refer to the accompanying plans.



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My last annual report contains a description of the ice-system of cooling a storage-room. It is not to be supposed, merely because we are building a cold-storage to be cooled by a system other than ice, that we, therefore, pronounce ice, as a refrigerant, unsatisfactory or out-of-date. Where only one temperature is required, or where moderate cooling is sufficient, or for short storage, ice is usually cheaper than the mechanical systems, and just as satisfactory. But the fact is, that different products require different temperatures for the best results; for example, apples keep best at a temperature of about 31 degrees, while butter requires for long storage a temperature of 20 degrees or below. These differences of temperature are difficult to obtain in the same building by means of ice, and the lower temperatures are practically impossible. Hence the mechanical systems, although more costly in the outfit and perhaps in the maintenance, are of wider application and of more extended usefulness. Only the ice system is possible in a small business. Also for short and occasional storage, the ice system is quite suitable. But in a large storage business, dealing in various kinds of produce and holding the produce for some length of time, the mechanical system is much to be preferred.

The importance of cold-storage for Ontario cannot be over-estimated. If the markets for these perishable products that Ontario can furnish in such magnificient quantities and excellent quality are to be captured and held in different parts of the world, it can be done only by maintaining unimpaired the quality of the products until they reach their markets. Cold-storage is an aid to this preservation; but its increasing use has drawn attention to other aids, and has given additional emphasis to the fact that only the best products under the best care are worth long storing or shipping. Cold-storage therefore, derives not its least importance, commercially, from the encouragement that it gives to improved methods in producing and handling our perishable food-stuffs.

Results of Experiments in the Cold Storage of Fruit.

(From Bulletin 123.)

1. Apples and pears keep best when wrapped singly in paper, and packed in a shallow box not larger than a bushel. They ship best when, in addition, they are packed in layers with excelsior between.

2. Apples keep better at a temperature of 31 degrees than at a higher temperature. Our experiments do not show what is the best temperature for pears.

3. Cold-storage cannot make bad fruit good; neither can it keep bad fruit from becoming worse. Only good specimens will keep for any length of time in cold-storage, or will pay for storage.

4. For long storage, it pays to select the best fruit and to pack it in the best manner known. The extra labor and the cost of material are more than repaid in the greater quantity and better quality of fruit left at the end of the storage period.

5. Wih apples and pears, at least, and, it seems likely, for most kinds of fruit, the fruit should be picked and stored in advance of dead ripeness. The maturing process goes or more slowly in cold-storage than on the tree or bush.

6. With the two kinds of fruit tried, apples and pears, the medium sizes of fruit kept longer than the largest, all being perfect specimens and picked at the same time. It would, therefore, be an advantage, especially with pears and peaches, to pick the larger specimens first, and leave the smaller to mature later.

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7. Fruit, on being removed from cold-storage, should be allowed to warm gradually, and moisture should not be allowed to deposit upon it. But if the wetting cannot be prevented, then the fruit should be spread out and dried as quickly as possible.

8. With all kinds of fruit, there is a time limit beyond which it is unprofitable to hold it in cold-storage, or anywhere else. That limit, for sound fruit, is dead ripeness. Duchess pears can be kept profitably until late in December; Fameuse, or Snow, apples, until March or April. The time limit has to be determined for each kind of fruit.

9. In addition to proper conditions in the storage-room, the most important points are the selection of sound fruit; grading into uniform sizes, one variety only in a case, and careful packing. Therefore, the results of these experiments can be made use of by the family, in preserving fresh fruit for their own use; by the fruit-grower, in securing better prices for good fruit later in the season, in the local markets; and by the shipper, in enabling him to take advantage of the higher prices offered in foreign markets.

Destruction by Lightning in Ontario, 1902.

The investigations carried on last year regarding the amount of damage done by lightning stroke, and the conditions of liability to the stroke, were continued during the past summer.

The reports received are tabulated below.

Buildings Struck and Burned, Wholly or Partially.

Circumstances.	Dwellings.		Churches.		Barns.	Stables.	Town Bldgs.	Loss.
	Brick.	Frame.	Brick.	Frame.				
Isolated	4	5	.....	.....	30	2	1	$7,640
Near Trees	1	.....	.....	.....	5	.....	1	3,700
Near other buildings	.....	2	3	.....	4	.....	.....	4,100
	5	7	3	.....	39	2	2	$15,440 00

It will be seen that the damage done to buildings by lightning is comparatively small, according to the reports sent in. Last year, about $47,000 worth of damage was reported; but this year, while a great number of buildings were reported to have been struck, the loss was only about one-third that of 1901. Of the 58 buildings struck, 47 were injured only to the amount of $50 each or less, and only 6 to the amount of $1,000 or over.

Only three of the buildings struck were provided with lightning rods. One was not injured; the other two, only slightly.

Of the total number of buildings struck during the summer, the frequency for each kind of building is indicated below in percentage.

Barns, with season's crop, 21; Barns, empty, 46—67. Stables, 4. Dwellings, 20. Churches, 5. Town buildings, 4.

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For some reason, probably the peculiarity of the season, the loss of barns after harvest is relatively small. Last year, the percentage of full and empty barns struck was the reverse of the above.

Stock Killed.

Circumstances.		Horses.	Cattle.	Sheep.	Hogs.	Value.
Under Trees.	Oak	.....	2	1	.....	$ 80 00
	Beech	1	.....	.....	.....	75 00
	Basswood	1	.....	.....	.....	200 00
	Spruce	1	.....	.....	.....	150 00
	Maple	.....	1	14	.....	100 00
Not specified		.....	.....	11	.....	75 00
Near fence		4	6	4	.....	700 00
In stable		5	.....	.....	2	750 00
Edge of bush		1	1	.....	.....	165 00
Near barn		.....	2	3	1	185 00
Without shelter		4	10	14	.....	630 00
		17	22	47	3	$3,110 00

These figures correspond in general with the results of last year. Both years' results show that a considerable per cent. of the animals killed were without shelter. This year, the proportion killed near fences is somewhat greater than last year. In every case reported, the fences were either wire ones, or a combination of rail and wire. This fact seems to give point to the question, if the wire fence is not a considerable source of danger. The precaution of connecting each strand of the wire fence to the earth at intervals of, say, 500 feet, is inexpensive, and is practically recommended as a safeguard against loss of stock in the field.

Trees Struck.

Kind and No. of Trees.	Situation.	Nature and extent of damage.
4 Elm	Isolated	3 split; 1 not specified.
1 Elm	In group.	Bark peeled.
1 Elm	In forest.	Bark peeled.
4 Oak	Isolated	1 completely shattered; 3 bark peeled.
1 Oak	In group.	Completely shattered.
1 Maple	Isolated	Bark peeled.
1 Maple	In forest.	Splintered.
2 Maple	In group	Destroyed.
1 Ash	Isolated	Bark peeled.
1 Ash	In group	Split.
1 Basswood	In group	Shattered.
1 Basswood	In forest.	Top broken off.
1 Hickory	Isolated	Scratched.
1 Poplar	In group	Split.
1 Beech	In forest	Limb taken off.
1 Willow	In group	Splintered.
1 Balsam	In group	Split.
1 Pine	In group	Destroyed.

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No particular species is definitely shown to be more liable to lightning stroke than others, although the elm has sustained the most injury during both seasons. On the other hand, the pine, which last year headed the list, has this season reversed its position.

Persons Struck.

No.	Circumstances.	Extent of Injury.	Remarks.
1	In porch of church	Killed	Building slightly injured.
2	Just outside house	Killed	2 children standing a few feet apart.
1	In house, by chimney.	Killed	
1	By window, in house	Injured	

With regard to the Lightning reports, there are two conclusions, deduced from last year's results also, but important enough to bear repetition. First, the value of trees as protectors. Of the 58 buildings reported as struck, only seven were near trees. It is permissible to conclude, that if the remaining 51 had also been near trees, fewer instances of destruction by lightning would have been reported. Although we have had as good chance to obtain reports from towns as from country, only four per cent. of the reports are of town buildings. The practice of planting shade-trees on both sides of streets in towns and villages is becoming prevalent in Ontario. If this practice were as prevalent in rural districts, it is more than probable that much less loss by lightning would occur.

As to the variety of tree it is best to plant, our reports do not show conclusively. A certain character of tree, however, is to be recommended, —one not too tall and slender, but still with a pointed crown. There is no tree that answers to this description better than the spruce used in shelter-belts. A girdle of these around the farmstead will form shelter against the storm and proptection from lightning stroke. The Canadian maple, the favorite shade-tree in Ontario, while not of the orthodox form as a lightning protector, must, nevertheless, be very serviceable in this respect when grown in sufficient numbers, as in a belt or row. The comparative immunits of town buildings from lightning, where the maple is the principal variety of shade-tree, confirms this statement.

The second conclusion concerns the lightning-rod. Only three rodded buildings were reported struck, and the three received but slight injury. There are, of course, two difficulties in the way of reaching decisive conclusions on this matter. First, the question may be asked, Would the buildings have been struck at all if they had not been rodded? To that question no certain answer can be given. The fact remains, however, that the buildings, being struck, were only slightly damaged. The second difficulty lies in the lack of data regarding the proportion of rodded and unrodded buildings over Ontario. It may be said that the number of rodded buildings struck, viz., three, bears as great a ratio to the total number of rodded buildings in Ontario, as the number of unrodded buildings struck, viz., fifty-five, bears to the total number of unrodded buildings. As yet, we have been unable to secure any data upon this point, and, therefore, cannot discuss the question.

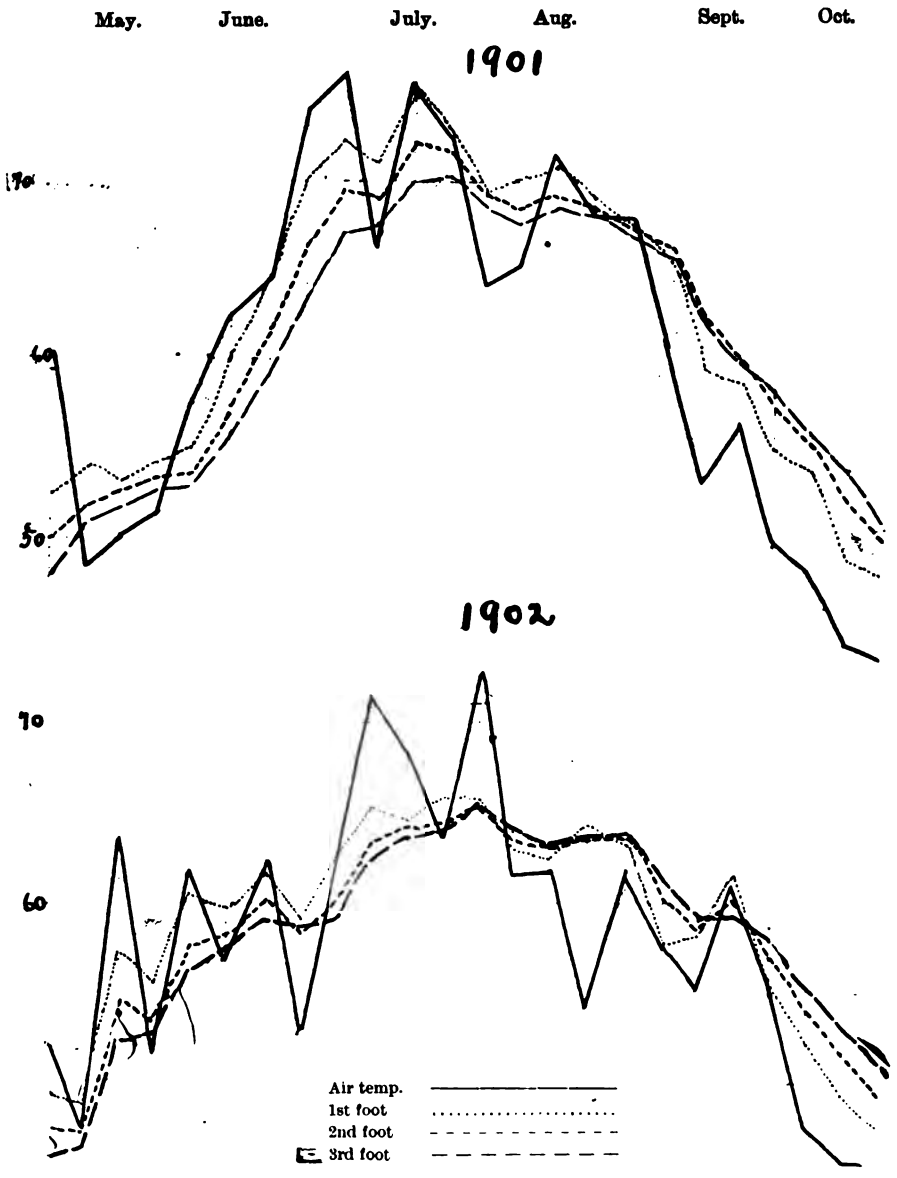
Sub-Soil Temperatures.

For the past two years, a record of the sub-soil temperatures at a depth of one, two and three feet, has been kept during the growing season. A

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condensed record of these observations, together with the average air temperature, is given in the following charts.

RECORD OF SUBSOIL TEMPERATURES.



Rainfall—					
1901..... 3.255	1.525	4.065	3.510	2.445	3.367
1902..... 1.674	3.055	6.430	2.180	3.575	2.816

It will be observed, speaking generally, that during the spring and summer months, the first foot is the warmest; but as the fall advances, this is reversed and the third foot retains its heat, as would be expected, longer than the upper layers of soil.

The maximum temperature reached this year, at a depth of one foot,

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is about ten degrees lower than that of last season. The difference is particularly noticeable during the months of June and July. It will be seen that, while for these months the average air temperature is not greatly lower than that of last year, the soil temperatures are very much lower. This is accounted for by the much greater rainfall during the months of 1902.

RAINFALL AND TEMPERATURES, DEC. 1ST, 1901, TO DEC. 1ST, 1902.

Month.	Temperatures.				Precipitation.		
	Maximum.		Minimum.		Rain.	Snow.	Total in inches of rain.
	Degrees.	Date.	Degrees.	Date.			
					in.	in.	
December	55.0	14	— 4.0	21 and 22	2.24	8.5	3.09
January	36.8	2 and 3	— 4.5	29	.....	11.5	1.15
February	47.8	27	— 4.0	5	.565	11.5	1.715
March	60.0	30	8.0	18	2.22	.25	2.245
April	76.0	23	25.0	5	2.433	.....	2.433
May	84.0	23	29.0	10	1.674	.....	1.674
June	83.0	16	35.0	9	3.055	.....	3.055
July	89.0	7	44.5	1	6.43	.....	6.43
August	85.0	1	43.5	12	2.18	.....	2.18
September	83.2	1	36.4	14	3.575	.....	3.575
October	68.0	25	27.2	17	2.816	.....	2 816
November	66.0	3	14.5	29	.933	3.0	1.233
Year 1902	89.0	July 7	— 4.5	Jan. 29	28.121	34.75	31.596
" 1901	94.0	July 2	—14.0	Jan. 19	23.607	45.10	28.117
" 1900	96.0	Aug. 6	—14.0	Feb. 26	20.011	61.7	26.181

Number of Days Sleighing: December, 19; January, 31; February, 25; total, 75 days, compared with 67 days in 1901 and 70 days in 1900.

THE NEW PHYSICS LABORATORY.

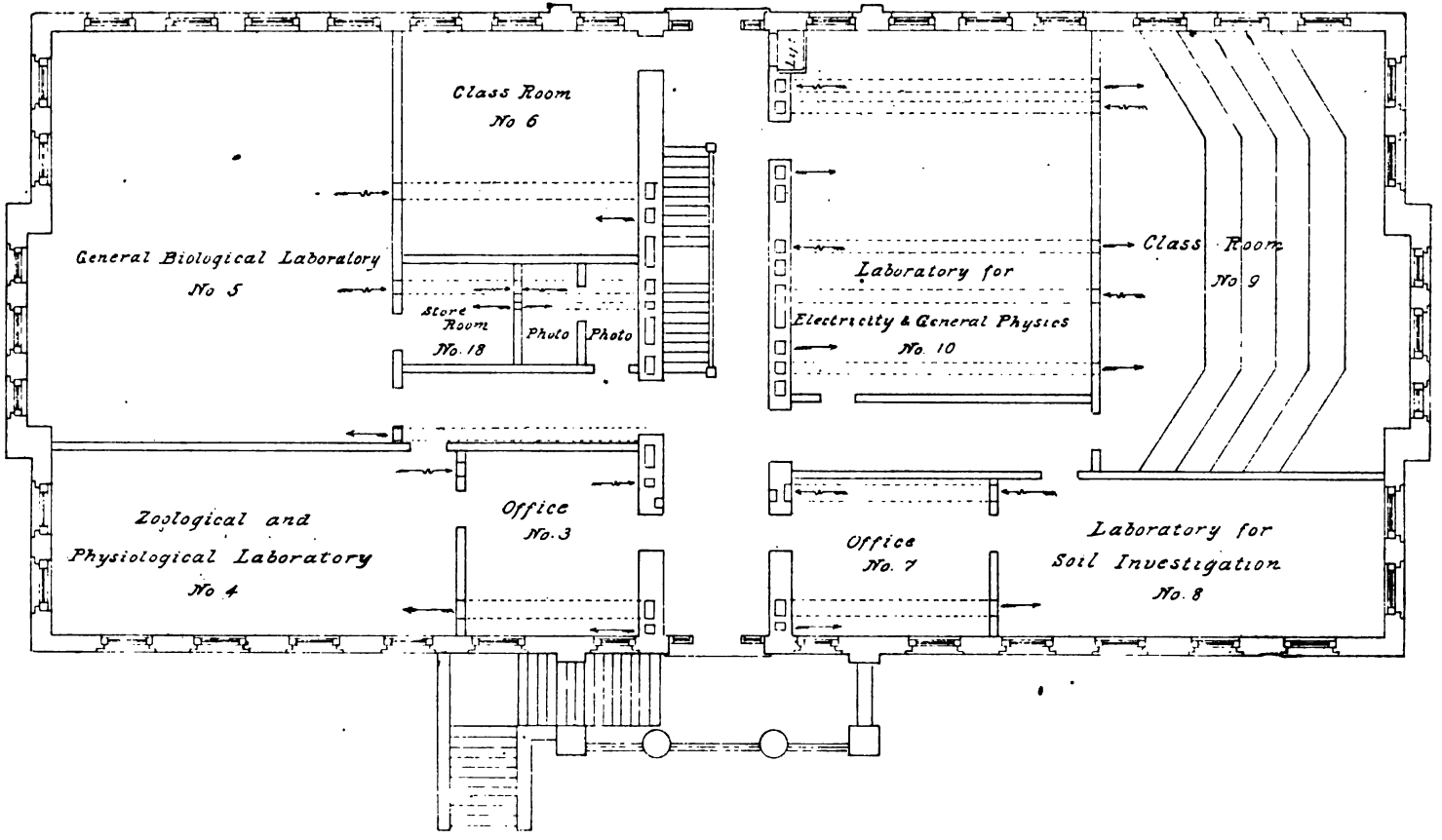
We were enabled to occupy the new quarters for the college year 1902-1903. The various rooms allotted to this department are as follows: Two offices, one class-room, two laboratories on the first floor for third and fourth year work, and one large laboratory, 36 x 50, on the second floor for first and second year work. These rooms have been well supplied with furniture, such as tables, cupboards, chairs, and stools. The department is now enabled to provide instruction in all branches of Agricultural Physics. For laboratory work, we are as yet scantily supplied with apparatus, but hope that this deficiency will be shortly made up.

In conclusion, allow me to thank you for your continued sympathy and support. Through your liberal understanding of the needs of the work under my charge, I was this year provided with a Fellow in the department. While fully appreciating the value of this provision, as a beginning, I beg to remind you that the position of Fellow lacks the permanence in occupancy that is conducive to the best work, and request, therefore, that an Assistantship be granted to this department.

Respectfully submitted,

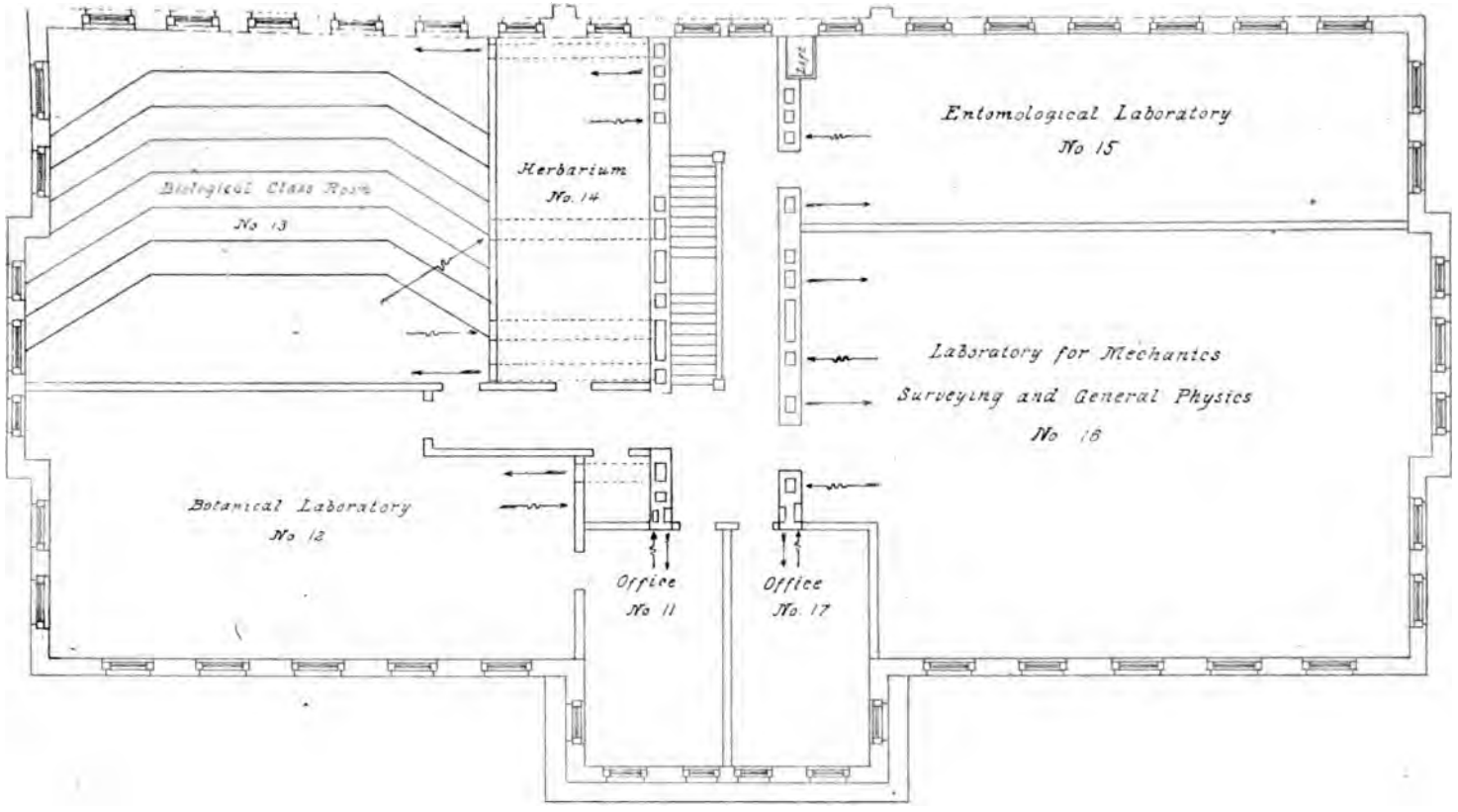
J. B. REYNOLDS.

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Physical and Biological Laboratory, Ontario Agricultural College.
First Floor.

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Physical and Biological Laboratory, Ontario Agricultural College.
Second Floor.

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PART IV.

THE PROFESSOR OF BIOLOGY AND GEOLOGY.

To the President of the Ontario Agricultural College:

Sir,—I have the honor of presenting herewith my Fifth Annual Report on the work done by the officers of the Biological Department during the year 1902.

Allow me, at the outset, to thank you for the liberal appropriations for the maintenance and equipment of my Department during the past year. While it is true that the appropriations were larger than usual, it is also true that the many demands which were made upon this Department involved a greater expenditure than usual. Our work is very comprehensive in its scope. It comprises the vast and many-sided fields of Botany, Entomology, General Zoology, and Geology. Each of these requires its own peculiar treatment, and its own equipment for work when instruction is given mainly in the laboratory. In the third year, for example, there are twenty-six students, who must be handled at one time. We have only fifteen microscopes, and an equipment for about six students in Practical Plant Physiology. To do efficient work, we need twelve additional microscopes, and a much larger equipment for Plant Physiology.

In my last two reports, I emphasized the pressing need for an Insectary, in which the life-history of insects can be worked out by the students. I had hoped that this want would be supplied with the erection of the new building, but I was doomed to disappointment.

After a year's experience in conducting a large class in practical Plant Physiology, I feel the pressing need for a green-house, which will serve both as an insectary and a physiological laboratory.

I beg, therefore, to call your attention to the great need for:

1. A green-house, to serve as an insectary and a laboratory for Experiments in Plant Physiology.
2. Twelve new microscopes, for the use of the second and third year students.
3. Additional equipment for practical work in Plant Physiology.
4. More assistance to enable us to carry on investigations into the life-histories of injurious insects and fungi which destroy the farm and garden produce of the Province. With the introduction of the Nature Study Course in April, May and June, very little time will be left the present officers of this Department for conducting investigations along these lines.

Class-Room and Laboratory and Instruction in Biology.

The new building, which we were privileged to occupy in September, is well adapted for our work, and already there is abundant evidence that better work is being done than was ever possible in the past. It is now possible to give every student that individual attention which is so necessary for the doing of good work.

On the first floor are an office, a pathological and physiological laboratory for 25 students, a general biological laboratory for 50 students, a seminary-room, a store-room, and a photographic-room; on the second floor are an office, a histological laboratory for 35 students, a large lecture-room, a

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herbarium, a store-room, and an entomological laboratory for 45 students. (See Plans).

In August, Prof. Doherty, who had not been well for some months, obtained leave of absence for a year, with the hope that a rest from his somewhat arduous teaching duties might restore him to his wonted health In September, Archibald Henderson, B.A., a graduate of Toronto University, and a specialist in Biology, was appointed assistant during Prof. Doherty's absence. He has done good work, and but few changes have been made in the arrangement of the Classes. T. D. Jarvis, B.S.A., Fellow, relieved Mr. Henderson of the field and laboratory work in Botany of the First Year, while I took over the Fourth Year Class in Grasses and Forage Crops.

In addition to the instruction given in the class-room and laboratories, to the regular students of the four years, considerable time and attention were given in January to the Short Course students, in the study of weeds, weed-seeds, and poultry parasites.

Following is a brief synopsis of the regular courses given in 1902 in Botany, Entomology, Zoology, and Geology.

Botany, First Year. (a) Field excursions, where the student familiarizes himself with the names of the common wild plants, learns their manner of growth, and the ways the fruit and seeds are produced and disseminated; (b) Laboratory studies of the entire plant, including root, stem, leaves and fruit; and (c) Lectures summarizing and illustrating the practical work,—by Messrs. Henderson and Jarvis.

Botany, Second Year. (a) Field excursions and laboratory studies in the morphology of plants, and their classification, a critical study of weed-seeds, and an elementary course in the study of grasses and fungi; (b) Lectures (two every week) on the morphology, classification, and physiology of plants,—by Mr. Lochhead, Mr. Doherty and Mr. Henderson.

Botany, Third Year. (a) Laboratory and lecture courses in systematic botany, including grasses, by Mr. Doherty; (b) Laboratory and lecture courses in fungi and plant pathology, by Mr. Lochhead; (c) Lecture and laboratory courses in plant physiology, by Mr. Lochhead and Mr. Jarvis.

Botany, Fourth Year. Specialists in Biology and Horticulture. (a) Laboratory and lecture course in plant histology by Mr. Henderson; (b) Laboratory course in fungi and plant pathology by Mr. Lochhead and Mr. Jarvis; (c) Seminary and practical course in plant physiology by Mr Lochhead.

Botany, Fourth Year. Specialists in Agriculture and Biology. (a) Laboratory course in systematic botany, by Mr. Doherty; (b) Lecture and laboratory courses in grasses and forage crops, by Mr. Lochhead.

Botany, Fourth Year. Specialists in Horticulture. (a) A laboratory course in the study of cultivated plants, by Mr. Lochhead.

Entomolgy, Second Year. A course of thirty-five lectures, demonstrations and practical exercises. The chief insect pests of the farm, orchard and garden are discussed and studied, under Mr. Lochhead and Mr. Jarvis.

Entomology, Third and Fourth Years. This course, consisting of lectures and practicals, deals with both beneficial and injurious insects, and is a continuation of the second year course. Here, the students become acquainted with the literature of the subject, by Mr. Lochhead and Mr. Jarvis.

Zoology, First Year. This course, owing to lack of room last spring term, consisted of lectures and practicals, thirty in all. The chief animal types from the Amoeba to Mammals are discussed, by Mr. Doherty and Mr. Jarvis.

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Zoology, Fourth Year. Specialists in Biology. A lecture and laboratory course, by Mr. Henderson.

Geology, First Year. A course of thirty lectures and demonstrations, dealing with the common minerals and rocks, the chief agencies operating in the formation of soils, and the geological history of the rock formations of Ontario,—by Mr. Lochhead and Mr. Jarvis.

Geology, Third Year. This course is a continuation of the first year course, but it is of a more practical nature, because the class is smaller. Considerable attention is given to the formation of soils through glacial action; and the geological history of North America is studied, with special emphasis on the Canadian region,—by Mr. Lochhead.

The work of instruction has been very exacting, both on account of the large number of classes which were placed in charge of the officers of this department, and the large amount of time required for procuring laboratory material, for collecting flowering plants, fungi and insects, and for mounting these as part of our permanent collections.

I would be doing an injustice to Mr. T. D. Jarvis, Fellow in this department if I did not recognize the value of his services during the year. He has been a faithful collector, and an efficient helper in the laboratory.

Outside Work.

(1) Correspondence. About one thousand letters were written to correspondents, who made inquiries regarding weeds, weed-seeds, insects and fungous diseases. Frequently, such inquiries necessitated some investigation, especially in the case of injuries done by insects and fungi.

(2) The preparation of Special Articles for the Agricultural Press. This phase of outside work is becoming an important one, but one which is a great time-consumer. Some idea of the variety of topics discussed may be obtained from the following list:

(a) The Plum-Twig Gall-Mite, in Canadian Horticulturist, p. 150.

(b) Ammonia-Copper Carbonate, in Can. Hort., p. 304.

(c) Fruit-Growing on St. Joseph and Manitoulin Islands, in Can. Hort., p. 387.

(d) Hollyhock Rust, in Can. Hort., p. 294.

(e) Black Knot, Lecanium Scale, Millipedes, and Mustard Spraying, Can. Hort., pp. 388-9.

(f) The Hessian Fly, in Montreal Weekly Star.

(g) The Wire-Worm and How to Destroy It, Farming World.

(h) The Potato Blight, in Weekly Sun, Can. Hort., p. 410.

(j) Warning Against Tent-Caterpillars, Codling Moth, Plum Curculio.

(i) The Care of Our City Streets, in Guelph Herald and Mercury.

(i) Warning Against Tent-Caterpillars, Codling Moth, Plum Curculio, and Brown Rot, in Guelph Mercury, May 23rd.

(3) The Preparation of Bulletins and Reports. Three bulletins were prepared during the year: (1) A Spray Calendar—Treatment of Insect Pests and Fungous Diseases (Bull. 122); (2) The Story of the Cabbage Butterfly, as part of Nature Study Bulletin 124; and (3) Peas and the Pea-Weevil, in co-operation with Mr. Zavitz (not yet published).

In January last, I presented my Third Annual Report as Inspector of Fumigation, which was printed as part of the Report of the Minister of Agriculture for Ontario. With the permission of the Minister of Agriculture, I resigned the position of Inspector of Fumigation Appliances, which I had held for three years.

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At the meeting of the Experimental Union in December, I presented a Report on Co-operative Experiments on the Treatment of Oats for the Prevention of Smut. Although the number of experimenters was not large, yet the results secured showed clearly that smut in oats can be entirely prevented by the use of formalin solution. This solution gave much better results than bluestone, and is to be recommended. (For full details of treatment, see Report of Experimental Union).

(4) Addresses at Farmers' Institutes and Fruit-Growers' Meetings. In June, I addressed Farmers' Institute meetings at Port Elgin, Owen Sound, Markdale, Shelburne, Beeton, and Duntroon; in August, at Sandfield, in the Manitoulins, and at the Sailors' Encampment on St. Joseph Island. In July, I addressed seven meetings of Fruit-Growers in Prince Edward Co. on matters pertaining to insects, fungous diseases, and spraying.

(5) Papers and Addresses for Annual Meetings. At the Annual Meeting of the Entomological Society of Ontario, held in London, Oct. 29th and 30th, I read the following papers, which will appear in the forthcoming Annual Report of the Society: (1) "The Injurious Insects of the Season of 1902;" (2) "A Key to the Insects of the Orchard;" (3) "How to Control the Pea-Weevil." On the evening of Oct. 29th, I delivered the annual illustrated popular lecture in the lecture-room of the Normal School. The subject was "Some Common Butterflies, and Some Noted Butterfly-Hunters." I had also the honor of being elected President of this Society for the coming year.

During the last week of June, I attended the meetings of the Association of Economic Entomologists of America, and those of the American Association for the Advancement of Science, held in the Carnegie Institute, Pittsburg.

At the Annual Meeting of the Fruit-Growers' Association, held in Walkerton Dec. 1st, 2nd and 3rd, I delivered an address on the "Injurious Insects and Fungi of 1902."

The Museum.

In the new Biology-Physics Building, ample accommodation has been provided for a College Museum on the ground floor. Cabinets and shelving are needed, however, to display the collections, and these we hope to procure by an appropriation from the Legislature at the coming session. A well-appointed agricultural museum is a necessary part of the equipment of a college such as ours, where so much of the instruction is given on the Nature Study plan, and which is visited by more than 35,000 persons every year. The heads of the Departments of the College are willing to co-operate in making the display an educational one. The various collections will be grouped into sections and thoroughly labelled, so that it will be an easy matter for a visitor to get much valuable information regarding the insects, plants, fungous diseases, relics, soils, rocks, minerals, woods, animals, bacteria, fruits, and seeds, in which he may be interested. It will be necessary, however, to procure as soon as possible many additions to our present meagre collections, if the educational feature is to be made prominent. I would, therefore, respectfully urge that an annual appropriation be made for the purchase of desirable exhibits for our Museum, and also that certain valuable local collections of insects, birds, and other animals, be purchased at once, before they are taken to the museums of the United States.

Some Injurious Insects and Fungous Diseases of the Year 1902.

1. A Saw-Fly Larva, Which Injures Apples. Many apple-growers report that considerable damage was done to ripe apples at apple-picking time by the larva of a saw-fly, which burrowed into the fruit to a depth of half an inch or more. The larva is about one-third of an inch in length,

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bluish-green on the upper surface, and light green beneath. I was unable to work out the life-history of this saw-fly, but Dr. Fletcher informs me that it is probably *Taxonus nigrosoma*, a form not very often reported, and hitherto not suspected of damaging fruit.

In most of the damaged apples there were many burrows,—in one I counted eleven, and every burrow contained a larva. The burrow is slightly larger than the larva, and is closed externally by a film of the tissue of the apple, put in place by the larva. The appearance of the burrow suggests that it is a place of hibernation, and it would appear as if the insect passed the winter in the larval condition. This condition, however, is not the usual one for saw-flies, and it may be that these particular larvae are belated forms, which did not reach maturity before the cold weather set in.

Regarding the habits of the larvae of this saw-fly, Mr. J. G. Jack (Can. Ent. XXV., p. 183) says:

"When they ceased feeding at full growth, the larvae abandoned the leaves of their food plant, which was *Polygonum Muhlenbergii* and prepared for pupating by boring into the green stems of the food-plant, or sometimes into some such substance as partially decayed wood, if it happened to be in the vicinity. In these burrows, pupation takes place without the formation of any cocoon. Within a week or two after entering their burrows, the insects emerge as saw-flies."

2. The Woolly Aphis of the Apple and Other Trees. For many reasons, we believe that the woolly aphis is increasing rapidly in the orchards of the Province, and is doing much serious injury. More reports than usual have reached us this year regarding the attacks of this pest; and, as its life history and habits are not generally known, a short account at this time and in this report may be acceptable.

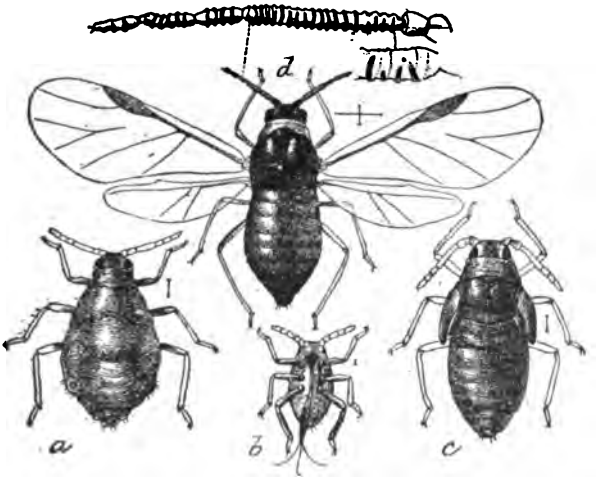


Fig. 1.—Woolly aphis (*Schizoneura lanigera* Hausm.)—*a*, agamic female; *b*, larval louse; *c*, pupa; *d*, winged female with antenna enlarged above; all greatly enlarged and with waxy excretion removed. After Marlatt, Division of Entomology, Department of Agriculture, U.S.

The Woolly Aphis (*Schizoneura lanigera*) usually exists in two distinct forms, one inhabiting the roots, and the other the stems. The root-inhabiting form is by far the more injurious, but is the less conspicuous. This insect may winter over in three ways: (1) as an egg in the crevice of the bark, deposited by a wingless female, after fertilization by a wingless mate at the close of the season; (2) some of the members of the stem colonies may possibly survive our winter, but it is very probable that most of the

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colonies perish; and (3) as an immature larva in the case of the root-inhabiting form. It is probable, also, that in early summer, the root-forms ascend to the stem and start stem-colonies, while in late summer the stem forms descend to the roots and become root-inhabiting forms.

In the spring, wingless females hatch from the eggs which have wintered in the crevices of the bark, and these reproduce themselves for several generations by giving birth to living young. Late in the season, winged females appear, which give birth to true-sexed, but wingless males and females. After mating, each of the females lays a single winter egg (Fig. 1). Throughout the summer, the infested branches are very noticeable. (Fig. 2.) The aphids occur in colonies or patches, and are covered with their



Fig. 2.—Woolly aphids on a stem.

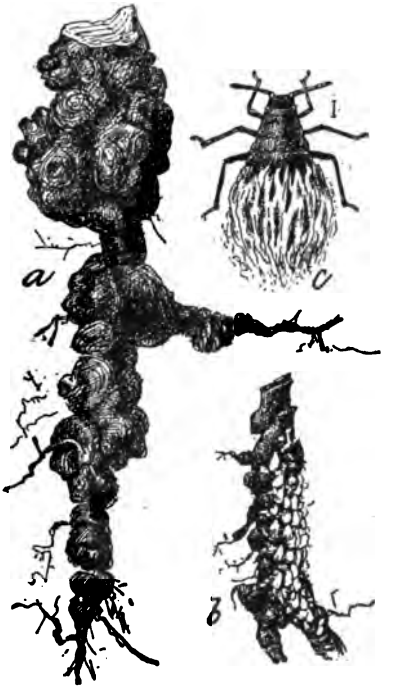


Fig. 3.—Woolly aphis.—*a*, root of young tree illustrating deformation; *b*, section of root with aphides clustered over it; *c*, root louse, female; *a*, and *b*, natural size; *c*, much enlarged. After Marlatt, Division of Entomology, Dept. of Agriculture.

flocculent cottony excretions. When the larvae are all young, little or none of the white substance is excreted. As soon, however, as they begin to absorb much liquid food, which the aphids are able to do by means of their long sucking beaks thrust into the tender tissues of the stems, they begin to excrete the flocculent covering.

The injury done by the woolly aphis on the roots is very characteristic. Galls and other enlargements arise, which result, sooner or later, in the death of the organs affected (Fig. 3). In the cracks which open up in the galls, the aphids live in clusters, and in a short time the vitality of the tree is reduced to such an extent that it is no longer profitable. Like many other sucking insects, woolly aphids injure their hosts in two ways: (1) by

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appropriating the juices which should go to the nourishment of the tree, and (2) by poisoning the tissues so that gall-like abnormal enlargements occur at the points of attack. In most cases of infested young trees, it will pay better to cut them down and burn them at once, than to try to combat the aphids.

When the stems are clustered with woolly aphids the bark becomes deeply pitted, due to the fact that the growth of the cells at the point of attack is stopped.

Several methods are recommended for the destruction of the root-inhabiting forms. (1) Hot water, but little below the boiling point, when applied about the base of young trees in sufficient quantity to wet the soil to a depth of several inches, has been found to be effective and practicable. (2) Tobacco stems, when broken up finely and distributed about the base of the infested trees, are also very effective. The surface soil should be first removed, the tobacco applied, and the soil replaced. The rains will carry the tobacco solution down among the roots, and destroy the aphids. (3) Carbon bisulphide, when poured into two or three holes about the tree, but not closer than two feet from the stem, is also effective. Into each hole, eight or nine inches deep, an ounce of the liquid should be poured, and the opening immediately closed. The liquid evaporates quickly, and the heavy fumes penetrate the soil about the roots, killing the aphids. The roots of nursery stock suspected of bearing aphids should be dipped in a strong solution of tobacco stems, or in hot water (temp. 150 degrees F.) for a few seconds, or in a hot soap solution, before the trees are planted.

The stem-inhabiting forms can be readily destroyed by applications of Kerosene Emulsion diluted with ten parts of water, or with soap wash.

3. A Bronze Beetle, Which Kills Birch Shade Trees. In several cities of Ontario, notably Guelph, London and Hamilton, the white birches are suffering from the attacks of the Bronze Birch-Borer (*Agrilus anxius*). This insect has not before this season been reported from Ontario, although it has been inflicting serious injuries on the birch shade trees of Buffalo, Detroit, Ann Arbor and Chicago. For the past two years, however, many birches of Guelph showed evident symptoms of disease, but it was thought that the causes were lack of water and food. A study of some of the badly-injured trees at Guelph and Hamilton revealed the true cause of the trouble. The bark of many of the limbs was riddled with holes, and within the wood there was a labyrinth of burrows, made by beetle-borers. The borers begin burrowing at the top of the tree, and gradually work downwards. For this reason, the tree begins to die first at the top, and careful examination is sometimes necessary to distinguish this condition from "Stag Head," produced by a lack of moisture and food materials.

The courses of the burrows made by the grubs are very irregular. Sometimes their labyrinthine courses can be traced for a considerable distance in the cortex and young wood, but frequently they run directly into the wood, and emerge again at the surface. A stem infested with borers can usually be told by the large number of ridges on the bark. In every case examined, a burrow ran beneath the ridge.

The effect of all this burrowing is to weaken the branches, and to interrupt the supply of food and food materials to the parts above. Death of the affected parts soon follows. In two or three seasons, the whole tree becomes riddled with holes and honey-combed with burrows, and death follows as a natural consequence.

The larva is of a creamy-white color, and 2-3 inch in length when full grown; the mouth-parts are nearly black, and the first thoracic segment (just behind the head) is much wider than the other segments.

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The beetle is between one-third and one-half inch in length, and is an olive-bronze in color (Fig. 4).

The life-history of the Bronze Birch-Borer is about as follows: The adult female beetle emerges from their burrow late in May, and straightway begins laying her eggs in crevices on the bark. The larvae hatch in June, and are not full grown when winter sets in. They remain torpid during the winter, and become full grown in April or early May.

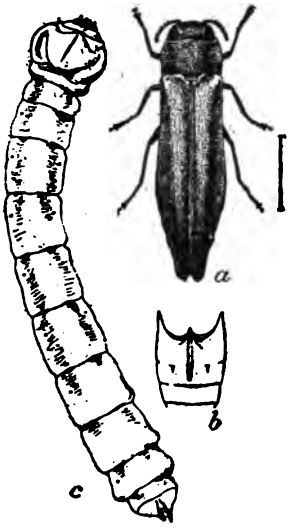


Fig. 4.—Bronze Birch Borer; *a*, female beetle; *b*, first abdominal segments of male from below; *c*, larva from above—all enlarged about 3½ times. After Chittenden, U.S., Dept. Agr., Div. Ent., Bull, 18, n. s.

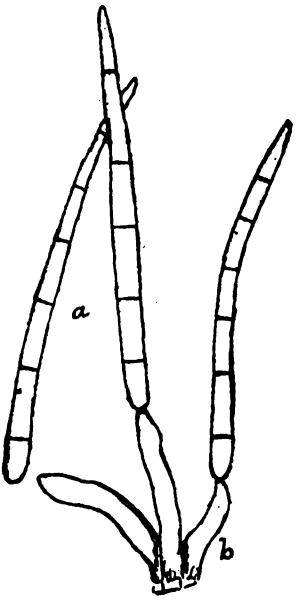


Fig. 6.—Leaf spot of the sugar-beet; *a*, the characteristic spores of the fungus causing the disease; *b*, the spore-thread bearing the spores (highly magnified).

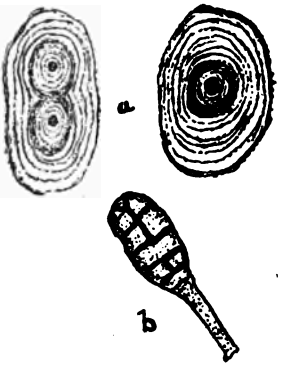


Fig. 5.—Brown Spot of tobacco. *a*, two spots, showing the concentrically zonal structure; *b*, a spore of *Macrosporium longipes*, the cause of the Brown Spot. (Original.)

Regarding the mode of escape of the beetles from the burrows, Mr. John Larsen (Mich. Acad. Sc., 3rd Report, p. 47), who made a special study of this insect, says: "The larva burrows out near the bark, then turning into the wood at a slight angle, an enlarged oblong chamber is formed in which the larva rests and undergoes further development in the spring. The burrow has been carried outward in rather a sharp curve, which brings its end to just beneath the bark beyond the chamber. When the beetle is ready to escape, it makes its way to this; and, eating through the bark, escapes. The larva is often found doubled up in the chamber. Normally, it lies with its ventral side turned outward, and the beetles are found in this position. Some were found reversed, and could not escape. The escape is rather laborious, as the insect must squeeze its way to the bark, and then, eating a small hole again, squeeze its way through. Beetles are found with the forward parts of their bodies protruding for hours, making long rests between efforts to free themselves. When the beetles leave the trees they leave a hole, which in outline has one straight side and one curved."

It is impossible at this stage in the study of the insect to indicate a definite line of remedial treatment. As the beetles are capable of flight, it is very necessary that dying and dead trees should be cut down and burned before the escape of the beetles in May.

We must, in addition to the foregoing measures, rely largely on the woodpecker to control the pest.

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4. A New Disease of Tobacco. Early in September, the lower leaves of the tobacco plants in the College garden began to show symptoms of disease. Brown spots appeared on both surfaces of the leaves, which rapidly enlarged, so that within a week, the leaves were literally covered with large, round, brown, dead patches. (Fig. 5a.) From the lower leaves, the diesase spread to the upper ones; and when the crop was harvested, there was scarcely a leaf which was free from the Brown Spot. At first, no spores could be found, and the name of the fungus was in doubt. Finally, however, about two months after the plants were cut, spores were discovered, and identified as belonging to the fungus called *Macrosporium longipes* (E. & E.), a close relative of the tomato rot and the early potato-blight fungi.

The characters of this fungus are: (1) The concentrically zoned spots; (2) the club-shaped and three to seven celled spores; and (3) the long stems of the spores (Figs. 5, 6).

This fungus was first described by Ellis & Everhart, in 1892, in the Journal of Mycology, Vol. VII., p. 134, from specimens of diseased tobacco leaves found in North Carolina; but not much notice has been taken of it since. It is very probable that one or two applications of the Bordeaux Mixture during August will keep this fungus in check.

5. A Leaf Spot of the Sugar Beet. Already growers of sugar-beets are making inquiries about a disease which produces a spotting of the leaves. The cause of the disease is a fungus called *Cercospora beticola*. It is by no means a new disease with us, for it may be found in almost every plot of mangels and beets grown under ordinary conditions. But, with the gradual development of the sugar-beet industry, and the cultivation of larger areas of the sugar-beet, we may expect to hear much about this disease.

The leaf-spot fungus first appears as small brown spots, with a purplish border, which are scattered irregularly over the leaf. The spots gradually become so numerous that the leaf is completely discolored and parched. Finally it blackens, dies, and drops off. If a little of the material of the dry spot be scraped off with a knife and examined in a drop of water, on a glass slide under a microscope, spores shaped like those in Fig. 6 may be seen. They are borne at the ends of short stalks, but are easily dislodged by the wind. They are readily carried to healthy leaves, where they may germinate and enter the tissues and reproduce the disease.

Sorauer, a great German authority, is of the opinion that this fungus may also be found on the peduncles and bracts of the flower, and even upon the seed-pods. He thinks that the seed may be the means of transmitting the disease.

The best methods of controlling this pest are: (1) To spray the crop with Bordeaux Mixture at intervals of three weeks, commencing when the plants are five to six inches high; (2) to adopt a rotation, and never to grow the sugar-beets on the same field two years in succession; and (3), to destroy all of the leaves. If the "tops" are fed to cattle, the manure should not be spread on land intended for sugar-beets.

6. A Leaf-Spot of the Horse-Chestnut. In many parts of the Province the horse-chestnut shade trees were attacked by a fungus, which caused a spotting and dying of the leaves: and, in many cases, when seriously attacked, the leaves fell from the trees. This fungus is known as *Phyllosticta sphaeropsoidea*.

On account of the absence of any system of spraying in our towns and cities for the control of fungous diseases and injurious insects, there is a danger that this disease may cause serious loss in a few years by the death

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of these valuable shade-trees. Experiments have shown that the disease can be controlled by applications of Bordeaux Mixture, and, to some extent, by the burning of the fallen leaves.

7. The Shot Hole Disease of the Plum and Cherry. This disease was very prevalent and destructive during the past season. The fungus (*Cylindrosporium padi*) forms numerous, small purplish spots on the leaves. These become brown, and finally fall out, giving the characteristic appearance as if riddled with shot (Fig. 7). The injured leaves usually fall from the

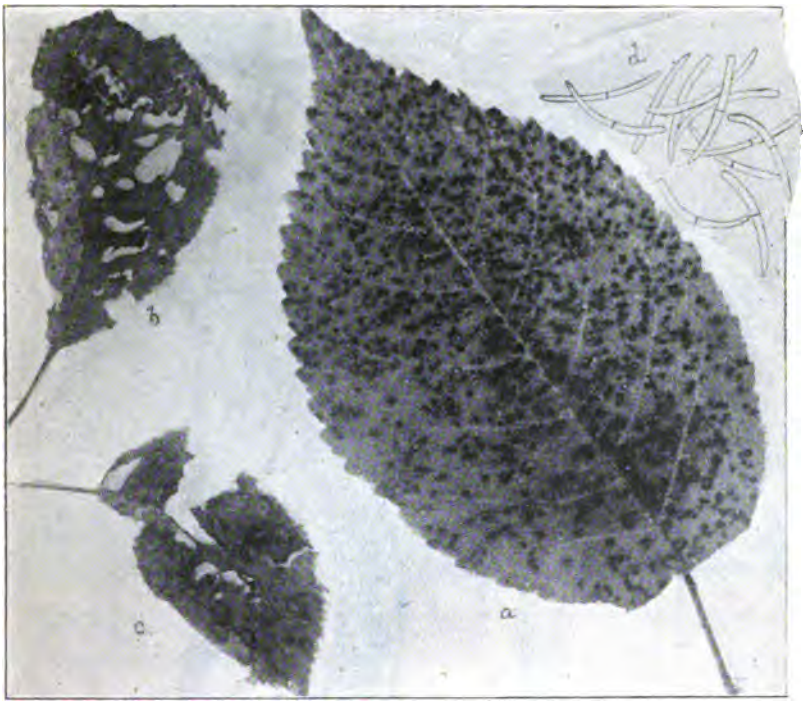


Fig. 7.—Shothole Fungus of plum and cherry (*Cylindrosporium padi*); *a., b., c.* leaves in various stages of attack; *d.* the spores of the fungus (much magnified).

tree, the growth is stopped, and fruit is seriously injured. Often a new crop of leaves is put forth, but this is followed by an immaturity of the wood, and the tree is very liable to suffer during the winter. As a matter of fact, this fungus is the primary cause of the winter-killing which is so common in some of our plum and cherry orchards. This disease may be prevented by spraying with Bordeaux Mixture. The first application should be made when the leaves are but half grown; the second and third applications at intervals of three weeks.

8. A Rot on Bean Pods Affected with Anthracnose. In November many of the bean pods which were affected with Anthracnose (Colletotrichum lindemuthianum), were observed to be rotting to a slight extent. The rotting areas were the Anthracnose areas, which in normal seasons do not soften. Moreover, a pink, thread-like growth, resembling a mould, covered the decaying spots. On examination, it was found that the fungus growth was that of *Cephalothecium roseum*, a supposedly saphophytic fungus. The spores and spore-bearing stalks were abundant, and could not be mistaken. The spore is oblong in shape, and slightly constructed at the middle by a partition, which divides it into two cells. (Fig. 8.)

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That this fungus is the cause of the rotting, there can be little doubt, and the question naturally arises, May this fungus sometimes act as a parasites on living tissues? It is very probable that it is, at least, a wound-para-

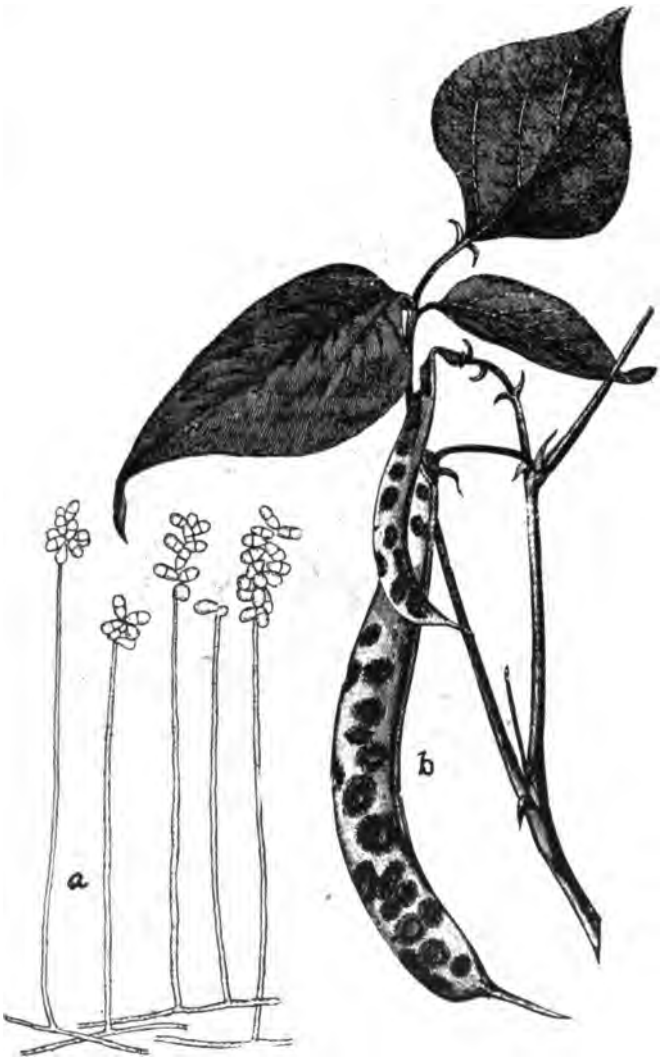


Fig. 8.—Pink Rot on bean anthracnose. *a*, spores and spore-threads of the Pink Rot, showing the shape, and arrangement of the spores. (After Cornell Bull. 207); *b*, bean pods attacked by anthracnose.

site, for the same fungus has been observed on the scab spots of apples this year (See Bull. 207, Cornell Univ.).

9. Other Injurious Fungi of 1902. The season of 1902 was abnormally moist, and was very favorable to the development of most of the injurious fungi of the orchard and garden.

The Apple Scab was very prevalent in all orchards, except those that were thoroughly sprayed with Bordeaux Mixture. The first spraying should be done when the buds are swelling, the second just before the blossoms open, the third when the leaves have fallen, and a fourth three or four weeks later.

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The Pear Scab was also very abundant, and there was much cracking of the fruit. Bordeaux Mixture will prevent the development of this fungus also.

The Sooty Fungus of apple (*Leptothyrium pomi*) was more common than usual, on account of the excessive moisture in most orchards.



Fig. 9.—Brown Rot of Plum (*Monilia fructigena*); *a*. Plum in the soft stage with abundant production of spores; *b*. Plums in the dry, "mummy" stage. After N.Y. Ag. Exp. St. Bulletin.

The Brown Rot was very destructive in 1902 in many plum orchards, and is, perhaps, the most serious of all the diseases affecting the stone fruits (Figs. 9 and 10). To combat this fungus, not only is thorough spraying with Bordeaux necessary, but also the burning of all the dry,

Fig. 10.—Spores of Brown Rot of Plum. (*Monilia fructigena*).

rotted plums of the previous year. The first spraying should be done before the buds open, and subsequent applications should be made every three weeks, until the plums are nearly full grown.

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The Late Blight of Potatoes, or Potato Rot, was very destructive over the whole Province. The potato grower has been in the habit of treating only for the potato beetle, but the experience of the past year should convince him that there is another enemy which may sometimes do more injury than the beetle.

As a combination mixture of Paris Green and Bordeaux will control both the beetle and the rot fungus, it should be applied every year to these crops. It is not difficult to prepare, and is as easily applied as is the Paris green alone.

Respectfully submitted,

W. LOCHHEAD.

THREE DANGEROUS TREES IN FRUIT DISTRICTS.

By T. D. Jarvis, B.S.A.

The Mountain Ash, Wild Plum, and Chokecherry are three common trees in the fruit districts of Ontario.

Botanically, the Mountain Ash is closely related to the apple and pear, and observation shows that the same insects are to be found on all three. Among these are the bud-moth, cigar case-bearer, tent-caterpillar, canker-worm, oyster shell bark-louse, scurfy bark-louse, apple plant-louse, and San Jose scale.

The Wild Plum has the same insect and fungous enemies as the cultivated plum, which is closely related to it. On these can be found the plum curculio, brown rot, and the shot-hole disease.

The Chokecherry and the cultivated cherry, which are also close relatives, have the same destructive enemies, viz., the tent-caterpillar, shot-hole disease, and the brown rot.

An extensive fruit-grower near Hespeler has an orchard (plum), surrounded by a double hedge-row of wild plum trees. Towards the end of June of the past season, I inspected his orchard, and found that the plums were badly damaged by Brown Rot. On inquiry, I found that this farmer had sprayed his plum trees, but had neglected to spray his wild plum hedge. He was surprised that the spraying had done very little good; but when I pointed out the Brown Rot in abundance on the wild plums, he ceased to wonder that his spraying had so little effect.

In the suburbs of London, Ont., I found an apple orchard, surrounded by a row of Mountain Ash trees. This was about the middle of May, when the bud-moth is in the most destructive stage. Nearly all the buds examined on the Mountain Ash trees contained a grub, which was the larva of the bud-moth. The apple trees were in a similar condition, in spite of continued sprayings. The explanation of the apparent ineffectiveness of the spraying in this case was the fact that the Mountain Ash trees harbored successive generations of Bud-Moths, that migrated yearly to the apple trees.

Complete, thorough, and timely spraying would be a satisfactory safeguard, notwithstanding the presence of insects and fungous diseases on neighboring trees; but no spraying is complete, and it is, at the best, running a foolish risk, to keep one's orchard surrounded by a congenial habitation for insect and fungous pests.

As for remedial measures, I would suggest the following: If the wild trees are few in number, they should be sprayed. On the other hand, if their preservation is not important, they should be cut down.

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PART V.

THE ASSOCIATE PROFESSOR OF BIOLOGY.

To the President of the Agricultural College:

Sir,—I beg to submit herewith my Second Annual Report as Associate Professor of Biology.

In making this report, I do so under regrettable circumstances. For some time my health was in a precarious condition, and, on medical recommendation, I was persuaded to apply in September for leave of absence, which you very kindly granted to me. Though not yet entirely recovered, I hope soon to be able to resume my duties.

Much of my time was occupied by lecture and laboratory work during the College session. Unfortunately, the conditions present in the old Biological Building were such as to make it impossible to obtain from laboratory work the best possible results. However, the new Biological Building furnishes much improved facilities, and it may be fairly expected that the students will acquire, as a result of the increased practical work, a much more thorough and lasting knowledge of natural science. Weed-Seed Identification and Systematic Botany received more attention than in previous years. Laboratory work was introduced in Zoology, and the results from the increased practical nature of the studies, were in every way gratifying.

Mustard Spraying.

Acting under instructions, I undertook demonstrations in mustard spraying during the month of June. I proceeded to Beachville, Nilestown, Parkhill, Stratford, Scarboro' Junction and Shelburne, making arrangements for carrying out practical demonstrations. Later, I visited these places in the order named, spraying in each case from two to ten acres. These demonstrations were in many cases largely attended by interested farmers, who, had they not seen the demonstrations performed, and the results which followed, could never have been otherwise convinced of the practibility of this method for destroying mustard.

From reports which have been received, it appears to be more certain than ever that this method is of the greatest value to farmers whose fields are invested with this weed pest. In every case where the spraying was not interfered with by rain, the results were highly satisfactory.

I would advise that in future years a far greater number of demonstrations be given during the month of June. As the period during which these operations can be carried on lasts only two weeks, it becomes necessary that to cover anything but a very restricted area, a number of spraying parties be organized, each being given certain counties. The importance of the work will justify increased attention and expense along this line.

Herbarium Work.

Owing to the fact that a large number of our common plants are missing from our Herbarium, it was deemed advisable to undertake the bringing together of a fairly complete and representative collection of the plants of

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this district. Several hundred plants were added during the past year, and it is hoped that shortly the flora of this district will be completely represented in our Herbarium. It is very desirable that increased attention be paid to the herbarium work of this Institution. Not only should the flora of the more settled districts be well represented, but collections should be made in the new regious, which are likely to undergo a complete transformation during the coming years.

Ornithology.

Increased attention has been paid during the past year to the study of the habits of our various species of birds, and, by your kind permission, we were enabled to have two lectures given to the students by Mr. C. W. Nash.

Much time was given during the spring and summer months to the observation and study of the injurious and beneficial habits of our native birds. The notes collected will form the subject of a later report.

Below is given "Bird Migration Notes" for 1902. In the collection of these notes, I desire to express by thanks for the valuable services rendered by Messrs. Kels, Klug and Beattie.

Bird Migration Notes.

The following table gives information regarding birds, observed by members of the Wellington Field Naturalists' Club, 1902:

Name of Bird.	First seen.	About how many were seen.	Next seen.	Became common	Last seen.	Common or Rare.	Does it breed near your Station.	Remarks.
Pine Grosbeak	Jan. 1	15	Jan. 2	.....	Ap'l 13	Not C..	No.	Winter visitor.
Evening Grosbeak	Feb. 6	75	Mar 24	.....	Mar 24	Rare ...	no..	"
Slate Colored Junco	" 8	6	Feb. 11	Mar. 23	Nov 8	C	yes.	
American Merganser	" 9	7	" 11	.....	Feb 15	Rare ...	no..	
Blue Jay	.....	....	.....	Res'dt.	.....	C	yes.	
Prarie Horned Lark	Feb. 15	2	Feb. 23	Mar. 10	.....	.....	...	
American Crow	" 15	8	" 22	" 7	.....	C	yes.	A few remain through the winter.
American Robin	" 15	1	Mar. 2	" 3	Nov 13	C	"	
Purple Finch	" 19	6	Feb. 22	Ap'l. 29	.....	.....	...	
American Goldfinch	" 19	20	" 28	May 1	Nov. 30	C	yes.	A few remain through the winter.
Song Sparrow	Mar. 8	3	Mar. 9	Mar. 9	Nov. 13	C	"	
Chickadee	.....	....	.....	Res'dt.	..	C	"	
Bluebird	Mar. 10	1	Mar. 11	Mar. 12	Oct. 11	C	"	
Bronzed Grackle	" 11	2	" 14	" 21	" 6	C	"	
Killdeer Plover	" 12	1	" 15	" 27	" 10	C	"	
Red-winged Blackbird	" 12	2	" 22	" 27	Aug. 29	C ...	"	
Meadow Lark	" 15	10	" 16	" 22	Oct. 10	C	"	
Red-tailed Hawk	" 15	1	Ap'l 12	....	..	Rare ...	..	
Red-shouldered Hawk	" 15	3	Mar. 16	Mar. 23	Oct. 10	Fairly C	yes.	
Mallard	" 15	2	Ap'l. 20	.....	May 28	Not C..	"	A few prs. breed.
Rough-legged Hawk	" 16	1	" 12	.....	..	Rare ..	...	
American Herring Gull	" 23	50	May 2	....	May 10	Not C..	no..	
Tree Sparrow	" 23	F	Mar. 25	...	Mar. 25	Not C..	no..	
Yellow-billed Sapsucker	" 23	1	Ap'l. 10	Ap'l 12	July 4	Fairly C	yes.	
Pine Siskin	" 23	F	" 6	.....	Ap'l. 14	C	"	
Savanna Swamp Sparrow	" 23	S	" 16	.....	.....	Not C..	"	
Ruffed Grouse	....	....	.....	Res'dt.	.....	C	"	
Flicker	Mar. 24	1	Ap'l. 5	Ap'l. 15	.....	.....	....	

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BIRDS OBSERVED BY WELLINGTON FIELD NATURALISTS' CLUB, 1902.—*Continued.*

Name of Bird.	First seen.	About how many were seen.	Next seen.	Became common.	Last seen.	Common or Rare.	Does it breed near your Station.	Remarks.
Vesper Sparrow	Mar. 24	S	Mar. 25	Ap'l. 12	Oct. 10	C	yes.	
Sparrow Hawk	" 25	2	" 28	.....	Aug. 19	Not C.	"	
Great Blue Heron	" 26	3	" 28	.....	Nov. 8	C	"	
Cowbird	" 26	1	Ap'l. 4	Ap'l. 5	Ju'y 4	C	"	
Downy Woodpecker	.....	...	.....	Res'dt.	.....	C	"	
Hairy Woodpecker	.....	...	.....	"	.....	Fairly C	"	
White Breasted Nuthatch	.....	...	.....	"	.....	C	"	
Phoebe	Mar. 27	1	Mar. 28	Ap'l. 5	Sep. 20	C	"	
White-rumped Shrike	" 28	1	Ap'l. 10	Ap'l. 15	July 25	C	"	Noticably scarcer this yr.
Golden-crowned Kinglet	.....	...	.....	Win'r r	.....	.....	...	
Kingfisher	April 6	1	Ap'l. 17	Ap'l. 25	Oct. 10	C	yes	
Winter Wren	" 6	1	" 12	.....	.....	.....	"	
Canada Goose	" 7	F	" 16	.....	Ap'l. 20	.....	"	Passing migrants.
Towhee	" 10	1	" 11	Ap l. 12	.....	Fairly C	"	
Cooper's Hawk	" 11	1	May 1	.....	.....	Not C.	"	
Swamp Sparrow	" 12	1	Ap'l 13	.....	.....	Not C.	"	
Chipping Sparrow	" 12	10	" 21	Ap'l. 23	Oct. 4	C	"	
Marsh Hawk	" 12	1	" 20	" 20	.....	Fairly C	"	
Tree Swallow	" 15	S	" 18	" 20	Aug. 17	C	"	
Wilson's Snipe	" 19	6	" 20	.....	.....	Not C.	....	
Barn Swallow	" 19	4	" 20	Ap'l. 21	Aug 30	C	yes.	
American Goldeneye	" 20	30	.....	.....	.....	Rare	no.	
Woodcock	" 20	5	Ap'l 27	.....	.....	Fairly C	yes.	
American Bittern	" 22	1	" 29	Ap'l. 30	.....	C	"	
Ruby-crowned Kinglet	" 22	6	" 23	.....	May 6	Not C.	no.	Passing migrant.
Goshawk	" 22	2	" 28	.....	" 1	Rare	no.	
White-throated Sparrow	" 23	2	" 24	Ap'l. 24	Oct. 8	C	yes.	
Field Sparrow	" 23	1	Oct. 7	.....	" 7	Not C.	....	
Loon	" 24	2	May 3	.....	.....	Rare	no.	" "
Broad-winged Hawk	" 24	1	.....	.....	.....	Rare	...	
Spotted Sandpiper	" 25	2	Ap'l 27	May 1	Sep. 30	C	yes.	
Hermit Thrush	" 27	1	May 1	.....	May 3	Rare	no.	
Red Headed Woodpecker	" 28	1	" 11	May 11	Sep. 22	C	yes.	
Black and White Warbler	" 28	1	" 1	" 2	" 1	C	yes.	
Rusty Grackle	" 28	1	.....	.....	.....	Rare	....	A pair noted breeding.
Water Thrush	" 28	1	Ap'l 29	May 1	July 4	Fairly C	yes.	
Myrtle Warbler	" 28	1	May 2	.....	.....	.....	no.	Common during migrations.
Brown Thrasher	" 28	1	Ap'l 29	May 11	.....	Not C.	yes.	
Chimney Swift	Ap'l. 30	12	May 2	May 3	Aug. 26	C	yes	
House Wren	" 30	1	" 9	" 13	Nov. 8	C	"	
Bank Swallow	" 30	4	" 1	" 16	.....	C	"	
Pintail Duck	May 1	S	" 2	.....	.....	Rare	no.	Spring and Fall visitor.
Bufflehead Duck	" 1	S	" 2	.....	.....	Rare	no.	" " "
Green-winged Teal	" 1	S	" 2	.....	.....	Rare	....	A few pairs breed.
American Scaup Duck	" 1	F	" 2	May 1	June 4	.....	yes.	
Short-eared Owl	" 1	1	.....	.....	.....	Rare	....	
Pigeon Hawk	" 1	1	.....	.....	.....	Rare	...	
Black-throated Green Warbl'r	" 1	S	May 2	May 2	July 31	C	yes.	A few breeds, mostly a passing migrant.
Bobolink	" 2	1	" 3	" 5	" 25	C	"	
Least Sandpiper	May 2	1	May 3	.....	.....	.....	no.	Passing migrant.
Bonaparte's Gull	" 3	4	.....	.....	.....	Rare	no.	
American Osprey	" 3	1	" 9	.....	.....	Rare	....	
Sharp-shinned hawk	" 3	1	" 5	.....	.....	Not C.	yes.	
American Eared Grebe	" 3	1	.....	.....	.....	Rare	no.	
Wood Thrush	" 3	1	" 13	May 16	.....	C	yes.	
Baltimore Oriole	" 4	1	" 8	" 16	July 25	C	"	
Yellow Warbler	" 4	1	" 8	" 5	Aug 11	C	"	
Blackburnian Warbler	" 4	1	" 7	.....	May 17	Not C.	no.	Spring migrant; few noted this year.
Kirtlands' Warbler	" 4	S	" 17	.....	.....	Rare	no.	Spring migrant.
Kingbird	" 4	3	" 5	" 6	Aug 29	C	yes.	
Whip-poor-will	" 4	1	" 11	" 16	.....	C	"	
Wilson's Thrush	" 4	3	" 13	" 15	.....	C	"	
Red-eyed Vireo	" 4	1	" 5	" 8	Sep. 16	C	"	
Olive-sided Flycatcher	" 4	2	" 5	.....	.....	Rare	...	
Great-crested Flycatcher	" 4	1	" 10	" 15	Aug 11	C	yes.	

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BIRDS OBSERVED BY WELLINGTON FIELD NATURALISTS' CLUB, 1902.—*Concluded.*

Name of Bird.	First seen.	About how many were seen.	Next seen.	Became common.	Last seen.	Common or Rare.	Does it breed near your Station.	Remarks.
Magnolia Warbler	May 4	1	May 15	....	June 5	Not C..	?	Mostly a passing migrant.
Least Flycatcher	" 4	2	" 5	May 5	.....	Fairly C	yes.	
Catbird	" 6	1	" 11	" 16	Sep. 20	C	"	
Solitary Sandpiper	" 6	1	.....	.....	....	Rare ...	no..	Passing migrant.
Ruby-throated humming bird	" 8	1	" 12	" 12	Sep. 15	Fairly C	yes.	
Yellow-throated Vireo	" 8	1	" 9	" 15	.....	C	"	
Yellow Legs	" 9	2	.....	.....	.....	.....	...	Passing migrant.
Purple Martin	" 10	2	" 17	.....	.....	.....	"	
Maryland Yellowthroat	" 11	2	" 30	.....	.....	Fairly C	"	
Palm Warbler	" 11	4	" 17	.....	.....	Not C..	no..	Passing migrant.
White-Crowned Sparrow	" 11	1	" 18	....	Oct. 6	Not C..	...	
Mourning Dove	" 11	1	June 28	.....	Aug 6	Not C..	yes.	
Rose-breasted Grosbeak	" 11	3	May 12	...	.....	Not C..	"	Very scarce this year.
Oven-bird	" 11	3	" 14	May 17	....	C	"	
Black-throated Blue Warbler	" 11	1	" 15	.....	May 20	Fairly C	no..	Passing migrant.
Redstart	" 11	2	" 15	" 20	.	C	yes.	
Canadian Warbler	" 11	2	" 15	.....	.....	Not C..	"	A few pairs breed. Most pass north.
Chestnut-sided Warbler	" 11	1	" 20	.....	June 5	Fairly C	"	A few pairs breed. Mostly passing migrants.
Bay-breasted Warbler	" 11	1	" 14	.....	.....	Fairly C	no..	Passing migrant.
Parula Warbler	" 12	S	" 14	.....	....	Not C..	no..	Passing migrant.
Indigo Bunting	" 12	1	" 20	" 28	Aug 29	C	yes.	
Scarlet Tanager	" 13	10	" 15	.....	.....	Not C..	"	
Warbling Vireo	" 13	1	" 14	.....	.....	Not C..	"	
Wood Pewee	" 13	1	" 14	" 17	Sep. 23	C	"	
Wilson's Warbler	" 13	2	" 17	.....	....	Not C..	no..	
Nashville Warbler	" 15	2	" 16	.....	May 29	C	no..	Passing migrant.
Olive-backed Thrush	" 15	1	....	.....	.....	Rare ...	....	
Sora Rail	" 15	1	.....	.....	.....	Rare ...	....	Extremely local.
Mourning Warbler	" 15	1	" 22	.....	....	Rare ...	....	
Black Poll Warbler	" 17	1	.....	.....	.....	Not C..	no..	Passing migrant.
Least Bittern	" 17	1	.....	.....	.....	Rare ...	no..	
Black Billed Cuckoo	" 19	3	" 20	June 2	Sep. 14	C	yes.	
Cedar Waxwing	" 19	10	" 20	May 20	July 31	C	"	
Brown Creeper	....	....	.....	Res'dt.	.....	Fairly C	"	
Night Hawk	" 19	1	" 20	.....	July 29	C	"	
House Sparrow	....	....	.....	Res'dt.	.....	C	"	
Pileated Woodpecker	" 20	1	" 25	.....	Sep. 14	Rare ...	"	
Traill's Flycatcher	" 22	1	" 23	....	.....	Rare ...	"	
Cliff Swallow	" 28	S	" 29	May 29	.....	C	"	
Screech Owl	Aug. 2	1	.....	.....	....	Not C..	"	
Peregrine Falcon	Sep. 19	1	.....	.....	....	Rare ...	...	
Snowflake	Dec. 2	5	...	.....	.....	Fairly C	no..	Winter visitor.

I have the honor to be, Sir,

Your obedient servant,

MANNING W. DOHERTY.

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PART VI.

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

Sir,—I beg to submit herewith my Second Annual Report.

The past year has been a very busy one in this Department. The extension of the course to four years, and the increased number of students in the classes, has made the teaching heavier than in previous years. There has also been a large number of calls for outside work, which had to be attended to, in addition to the investigations mapped out for the year. The sugar-beet experiment and the search made for lime-stone suitable for use in the manufacture of sugar, absorbed a large portion of our time.

W. C. Good, B.A., who commenced upon his duties as Assistant Chemist last January, has rendered efficient service.

TEACHING.

During the year, my first endeavor has been to make the instruction given the students of all classes as thorough and practical as possible. My past experience in teaching Chemistry has convinced me that, what a student proves by practical work in the laboratory, he has mastered in a way that no amount of reading and lectures would enable him to do. At the same time, it develops a thoughtfulness and self-reliance that no other method of instruction can possibly give. Fully believing this, I have sought, so far as time and our equipment would permit, to have every student work out each point for himself; and then in the lecture-room, I have endeavored to confirm and develop their conclusions, and by continual reviewing, to keep the whole subject before their minds. In this, I am following up the methods of my predecessor; but I am trying to develop it more and more, especially in the Agricultural and Animal Chemistry of the Second Year. With this Class, I have abandoned the qualitative analysis, and am devoting the time formerly given to it to experiments planned for the purpose of demonstrating the work covered in the lectures.

During the past year, my associate, Prof. Gamble, has taught the Inorganic Chemistry of the First and Third Years, and the Chemistry given to the students of the Dairy School. With some help from my assistant, Mr. Good, I have taught the Organic, Agricultural, Animal, and Dairy Chemistry of the Second, Third, and Fourth Years. The extension of the course for the B.S.A. degree to one of four years has made it possible to give the Agricultural and Horticultural specialists a training in gravimetric work, which gradually led into the analysis of drinking water, fertilizers, fodders, etc. This work was very much appreciated by the classes.

At the request of Mr. Graham, I gave four lectures in January last to the students in the Short Course on Poultry Raising. These lectures dealt mainly with the question of feeding,—the amount and nature of the various constituents forming the ordinary foods, the relative value of these constituents, and the need of combining them in proper proportions, to secure the best results in fattening and in the production of eggs.

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For the last two years, all the practical work in Chemistry taken by the members of the Dairy School Class was given in the Milk-Testing Room of the Dairy Building. We have found this very inconvenient in many ways; and, with your permission, I have had part of the basement of the Chemical Laboratory fitted up for this purpose, where, I am sure, better work will be done. This will enable us to give better instruction to the whole class; and, because of the equipment at hand, it will be possible to give more advanced work to those who desire it. The teaching of Dairy Chemistry, together with chemical investigations for the Dairy Department, is an important part of our work, and one which should have a full share of our time. To insure the careful attention it deserves, I have arranged with Prof. Gamble to take charge of this branch of the work. He will also have charge of the Dairy Chemistry taught in the regular course for the B.S.A. degree.

Miscellaneous Work.

Outside of class-room instruction, my work has been very varied. The correspondence has been fairly heavy,—about 900 letters having been sent out in answer to inquiries of all kinds. To answer many of these, considerable laboratory work and reading was necessary.

During the year I have attended the following conventions, for each of which I had to prepare a paper:

Western Dairymens' Association, Woodstock, Ont.
Eastern Dairymens' Association, Whitby, Ont.
Dairy Conference, Ottawa, Ont.
Dominion Master Bakers' Association, Toronto, Ont.

In April, I gave an address on "Flour" before the ladies of the Ontario Normal School of Domestic Science and Art, Hamilton. I have also addressed a number of meetings in connection with the sugar beet industry.

In October, with your kind permission, I attended the meetings of the Association of Official Agricultural Chemists, in Washington, D.C. The various reports and papers read were practical, and exactly on the lines of work in which I am particularly interested; such, for instance, as the analysis of agricultural products. I may say that I have never attended any other meetings from which I received so much instruction and inspiration. In connection with the work of this Association, I was, last winter, appointed Associate Referee on the separation of nitrogenous bodies. At the meeting in October, it was decided to divide this subject into three branches. The sub-division and distribution of the work was agreed upon as follows:

Referee—Dr. Van Slyke, Geneva, N.Y., Milk and Cheese Proteids.

Associate—Dr. Biglow, Bureau of Chemistry, Washington, Meat Proteids.

Associate—R. Harcourt, Guelph, Vegetable Proteids.

I have accepted the position, because the work is important from an agricultural standpoint, and one upon which I have spent some time; and because I consider it an honor and a privilege to be thus brought into direct contact with these men, who are undoubtedly leaders in the line of work which has been allotted to them.

Illustration Plots on Whitby Fair Grounds.

In the spring, I was asked by Mr. G. C. Creelman, Superintendent of Fairs for Ontario, Department of Agriculture, to grow some sugar beets on the illustration plots which the Fall Fair Board had decided to have as

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one of the educational features of the so-called "Model Fair" at Whitby, Ont. On consenting to do this, I was further asked to select the most suitable place for the plots, prepare the seed-bed, select the crops to be grown on the various plots, and attend to the cultivation throughout the season. Exactly one-half an acre of ground was prepared, and divided into 40 plots, each two rods long by one wide. After consulting Mr. Zavitz, I selected the following seeds as the most suitable for the purpose:

Clovers:
- Lucerne,
- Mammoth Red,
- Common Red,
- Alsike.

Millets:
- Japanese Panicle,
- Japanese Barnyard,
- Hungarian.

Corn:
- Mastodon Dent,
- Wisconsin Earliest White Dent,
- North Star Yellow Dent,
- Compton's Early.

Swedish Turnips:
- Kangaroo,
- Sutton's Magnum Bonum,
- Hartley's Bronze Top.

Grasses:
- Timothy,
- Orchard Grass,
- Awnless Brome Grass,
- Tall Fescue,
- Tall Oat.

Sorghums:
- Kaffir Corn,
- Millo Maize,
- Early Amber Sugar Cane.

Fodders, Forage, and Pasture Crops:
- Hairy Vetches,
- Common Vetches,
- Grass Peas,
- Early Yellow Soy Beans,
- Medium Green Soy Beans,
- Whip-Poor-Will Cow Peas,
- Dwarf Essex Rape,
- Thousand-Headed Kale.

Fall Turnips:
- Cow Horn,
- Greystone.

Kohl Rabi:
- Early White Vienna.

Marigolds:
- Evan's Improved Mammoth Sawlog,
- Carter's Champion Yellow,
- Carter's Warden Yellow Globe.

Sugar Beets:
- New Danish Improved (for feeding purposes).
- Kleinwanzlebener (for factory purposes).

The plan of the plot, and the arrangement of the crops, is shown in the following diagram:

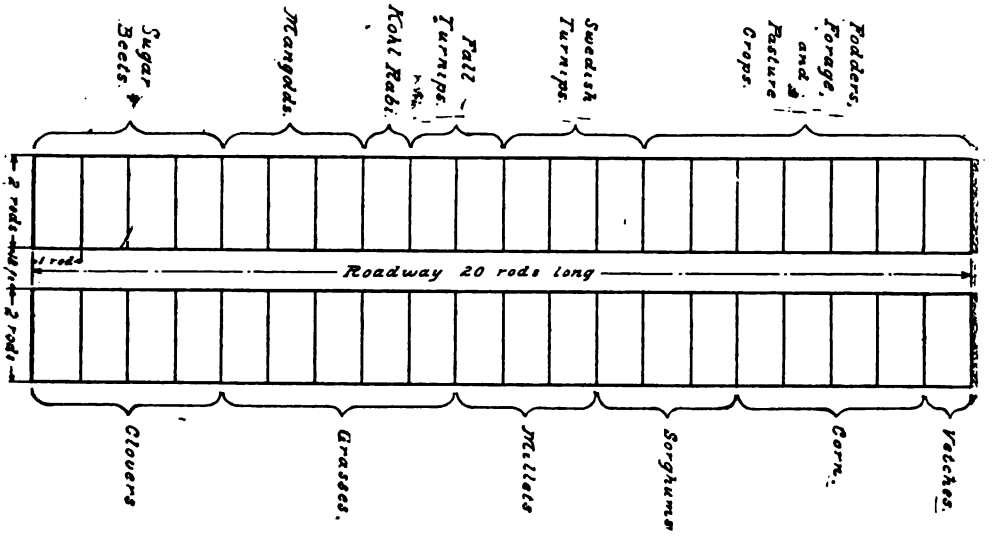


Diagram of Illustration Plots on Whitby Fair Grounds.

To show the sugar beet plants in various stages of development, three plots were selected, upon which the seed was sown at three different dates. These various crops were grown on a very light, sandy soil, which had been

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in sod for many years. It was not a very desirable piece of land; but owing to the wet season, and the very thorough cultivation given, under my direction, by Mr. Geo. Stericker, the crops all grew remarkably well, and made a very interesting and instructive feature of the Fair.

Illustration Sugar Beet Exhibit at the Industrial Fair.

Acting on directions from the Minister of Agriculture, I prepared an exhibit of sugar beets for the Industrial Fair in Toronto. The Fair Board kindly placed at my disposal the same space as was used last year, and the same plot of ground, to illustrate the methods of cultivation. The following paragraph is taken from the "Farming World," and illustrates the interest taken in the exhibit:

"The exhibit of sugar beets at the Exposition, made under the direction of the Minister of Agriculture by Prof. Harcourt, was one of the most interesting and instructive exhibits upon the grounds, as was evinced by the large crowds of people who were deeply interested in getting all the information possible from those in charge."

"Immediately outside the building was an illustration plot, in which beets were shown in different stages of growth. Some sown in April had attained their full growth, and were rapidly developing sugar. Some were just ready for thinning and others had recently been thinned. The plot was certainly an object lesson to those not familiar with sugar beets grown for sugar. Inside the building, samples were shown from six experimental sections conducted this year by the Government, under the supervision of Prof. Harcourt. These districts are,—Brantford, Brussels, Guelph, Markham, St. Catharines, and Orangeville. There were samples also shown by the four factories now building, and which will be in operation this fall. The most instructive feature was the exhibit of typical shaped beets alongside of some which had been improperly grown, also the method of topping required by the sugar factories. Beets improperly grown showed fully 30 per cent. waste, while those properly grown had only about 10 per cent. The exhibit of implements used in the cultivation of the sugar beet also attracted considerable attention, and was of great interest to those who think of growing beets next year. Photographs of the Wallaceburg and Dresden factories were shown, also photos of school children thinning beets. The growth of the sugar beet industry has been remarkable in Ontario. Four factories are now under construction, costing over $2,000,000, and it is estimated that nearly $1,000,000 will be paid for beets this year."

Acidimeter.

In the spring of 1901, a circular was issued by the Dairy, Bacteriological and Chemical Departments of the College, offering assistance to all persons interested in dairy work. In this circular, we also offered to supply decinormal alkaline solution at $1.00 per gallon. This solution is used for testing the acidity of cream for churning, and the acidity of milk and whey in the various stages in the manufacture of cheese. At the Dairy Convention, held at Ottawa last spring, the following resolution was passed:

"Resolved that the use of the fermentation test and acidimeter be adopted by cheese and butter makers, and that the Provincial Department of Agriculture be requested to make arrangements to furnish alkali solutions of the proper strength at a nominal cost; also that, as uniformity in the strength of the alkaline solution used in the acidimeter is desirable, the strength of the solution used should be equivalent to ten grams of lactic acid in a litre of distilled water, and that a 10 c.c. pipette should be used to measure the samples."

In accordance with the above request, all solutions sent out this summer have been of the strength recommended. About fifteen gallons of the solution have been sold. The use of the alkaline solution for testing the acidity of milk and whey in cheese-making is gaining favor, and has, with some of our best cheese-makers, almost replaced the hot-iron test.

From time to time, a considerable number of miscellaneous substances have been sent to the Laboratory for examination. Some of these have been analysed; but, in other cases, a few qualitative tests have sufficed to answer all that was required. I have steadily refused to make analyses of soils, unless I knew the samples were properly taken, and that the results

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when obtained, would be of value, not only to the person desiring them, but to the Province at large. Acting on the recommendation made in last year's report, I have referred a number of applicants for water analyses to the Board of Health Department in Toronto. We have, however, made a few analyses for Dairymen.

Investigation Work.

Under this heading, I have given a very condensed report of the investigations planned for the year, and the results of such analyses as may be of general interest.

Hamilton Sludge.

Two years ago, a sample of the sludge obtained from the Hamilton Sewage Disposal Works was analysed. The same year, a practical test was made of its fertilizing value. In this experiment, sludge, at the rate of 1,000 lbs. per acre, was applied to a timothy meadow, and increased the yield of hay about four per cent. Dr. Shuttleworth, in reporting on the analysis, said: "I am sure that if this sludge were dried, ground, and applied in sufficient quantities, it would be beneficial to certain crops, as corn, wheat, barley, etc. Applied to land in the form of mud, or in the form of hardened lumps, it might possibly be a physical injury to the soil."

The substance known as sludge consists of solid matter, recovered by certain processes of treatment from the sewage of our larger towns and cities.

The sludge received this year had been dried and ground, and was, therefore, in a much better condition to apply to land. It also contained a little more plant food than that analysed two years ago. The per cent. of nitrogen, potash, and phosphoric acid found in it is given in the accompanying table:

Analysis of Sludge.

	1900	1902
Potash (K_2O)	.097	.14
Phosphoric Acid (P_2O_5)	.380	.59
Nitrogen (N)	.525	.84

These results correspond very closely with those obtained elsewhere. A ton of this sludge contains about the same amount of fertilizing ingredients as a ton of ordinary farm-yard manure, but the plant food is not in so available a form. This is what might be expected; for only that part which is insoluble is recovered in the sludge, and thousands of tons of plant food are annually carried away with the water. The use of water as a means of carrying away the sewage from the houses in our towns and cities is a success from a sanitary standpoint, but it is accompanied by a sad waste of plant food. Many methods have been devised to prevent this waste, but none of them have been really successful.

Fish Food.

At one time, the little brooks and streams throughout the Province were full of speckled trout, which furnished sport and food for the angler. Because of the removal of our forests, and the subsequent drying up of many of these little streams, and the close fishing of the more favorable spots, this fish has almost ceased to live under natural conditions. During

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the last few years, sportsmen have constructed artificial ponds, and stocked them with trout, and have replenished the supply in many of the streams in which this valuable fish still remained. What was first done mainly for the anglers' sport, is now being done for commercial purposes; and to-day thousands of these fish are taken from artificial ponds to supply the demands of restaurants in our larger towns and cities. With the growth of this industry, the feeding of the fish has become a problem of economic importance. A little hand-book, published by the Caledon Mountain Trout Co., has the following regarding the feeding of young fish:

"At present, the principal diet is the beef liver, which has been carefully prepared for the infant fish, but it has been found that this kind of food not only affects the color of the flesh and its flavor, but reduces their robust character; the offspring are delicate, and only a small percentage ultimately survive. The expense, moreover, is a consideration, the cost being four to five cents per pound for an unsatisfactory article of diet. Mr. Charles Wilmot has discovered an important change in feeding the young fish by using the eggs of the salmon trout, tons of which he annually collects from the waters of the Georgian Bay, at one-third of a cent a pound. This excellent natural food is not only much cheaper in itself, but the fish retains the natural wild flavor, which is so desirable a quality of this delicious table luxury. Therefore, this is a most successful improvement in fish culture."

In spite of what is said against beef liver in the above quotation, it is used so extensively that it cannot be procured in sufficient quantities to supply the demand. Last July, C. C. James, M.A., Deputy Minister of Agriculture, sent to our Laboratory a sample of food, which was being fed to trout-fish, requesting that the amount of protein and fat in it be determined and compared with that in liver. This food appeared to be simply fish refuse, and the results of the analyses are given in the following table:

Determination of Crude Protein and Fat in Trout Food and Beef Liver.

	Moisture.	Nitrogen.	Crude Protein.	Fat.
	In Original State.			
Trout Food	8.74	12.46	77.88	12.03
Liver	70.59	3.40	21.26	5.02
	In Dry Matter.			
Trout Food	....	13.65	85.31	13.18
Liver	....	11.90	74.37	17.05

The different forms of protein in these two substances were not determined; but, judging from the general analysis, we would say that the trout food possesses a greater food value than the liver. It also contains a greater amount of bone-building material, which doubtless has a special value in the feeding of young fish, as it has in the feeding of young animals.

Water in Butter.

In November, a sample of butter was received, which, upon examination, was found to contain over 53 per cent. of water. This butter had been sold in Toronto, in tubs and crocks, at the regular market price. The person who sent us the butter bought it believing it to be a first-class article. He said, "The tester was put to the bottom of the crock, and the butter withdrawn showed no signs of the excessive amount of water." "There was no water in the bottom of the crock, and the butter turned out leaving the crock clean and dry."

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Upon examination the butter was found to have the following percentage composition :

Water	53.15 per cent.	Curdy Matter	1.50 per cent.
Fat	41.21 " "	Salt	4.14 " "

The determination of the volatile acids of the fat showed that the butter had not been adulterated with animal fats, at least not to any appreciable extent. The chief fault to be found with the butter was its abnormally high water content. No doubt it had been treated with one of the so-called nostrums, which have made it possible for the dealer to make a handsome profit in selling water at 20 and 22 cents per pound.

From examinations of butter, made in our own laboratory and at Ottawa, it has been found that the average per cent. of water in creamery butter is a little over 12, and that very rarely does it exceed 15. In this country there is no law fixing the amount of water which may be in butter, consequently there is nothing to prevent such butter being sold. The British Government has recently passed a law whereby butter entering that country containing over 16 per cent. of water is legally considered adulterated.

Does the Amount of Nitrogenous Matter in Butter Affect its Keeping Quality.

This has been a debated question for a long time, and one which has never been definitely answered. In the hope of obtaining some figures that would help to answer the question, we have, during the past summer, determined the nitrogen in a number of samples of butter, churned in different ways, and washed with different quantities of water, and in butter from cream separated in different ways and at various temperatures. The results are given in the following table:

Description of Butter.	No. of samples Analysed.	Average per cent of Nitrogen.	Average score at end of three months. Max.-100.
Buttermilk drawn off when butter grains were of "corn" size....	9	0.081	Not scored.
Ditto, when grains were of "wheat" size.....	9	0.076	"
Butter washed with brine	6	0.084	94.
" " water	6	0.085	94.
Butter worked once	4	0.085	Not scored.
" twice	4	0.077	"
" three times	4	0.077	"
Butter made from cream separated at 90 degrees F	3	0.070	92.5
Ditto, at 140 degrees F	3	0.087	92.8
" 160 " F	3	0.091	93.3
" 180 " F	3	0.079	94.75
Milk set in shallow pans	2	0.079	78
Deep setting	2	0.083	87
Bad butter from Guelph groceries	4	0.090	very low.

While there has not been enough work done to prove anything conclusively, these results indicate that the presence of more or less nitrogenous matter in butter does not necessarily affect its keeping quality.

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Investigations Regarding the Ripening of Cheese.

For the past two years, considerable time has been given to the study of the chemical changes that take place in the casein, or nitrogenous part of cheese, when cheese is ripened under different conditions as to temperature. As it is not definitely known what compounds are formed from the casein during ripening, no reliable methods for their separation have been devised; consequently, the work on this line has been slow, and the results are not ready for publication.

Some results have been obtained regarding the rate at which curd is rendered soluble when the cheese is ripened in cold-storage, at a temperature of 38 to 40 degrees F., and in the ordinary curing-room at 65 degrees F. Although this work will not be completed for some time, it may not be amiss to give some of the results obtained. The plan of the experiment was as follows:

Two cheese, made from one vat of milk, were placed,—one in cold-storage and the other in the ordinary curing-room. A sample was taken for analysis when the cheese were removed from the press, and once each month throughout the season. A pair of cheese were put away for this work each month from April to November inclusive, but no analyses were made of any of the cheese in September.

In the following table, the per cent. of the total casein that became soluble in water from month to month when the cheese were kept in cold-storage is given under A, and under E the same is given for cheese kept in the ordinary curing-room:

Date of making.	Length of time from making to analysis.	Rate of ripening, as indicated by the per cent. of total case in of cheese rendered soluble.	
		A.	E.
April 28th	30 days	8.0	15.5
"	2 months	11.1	22.7
"	3½ "	13.4	29.2
"	5½ "	31.2	33.0
"	6½ "	28.1	31.2
*May 12th	1 day	2.7	2.7
"	1 month	7.4	14.1
"	2 months	9.2	17.9
"	3 "	11.2	21.8
June 16th	1 day	4.0	4.0
"	1 month	13.5	22.7
"	2 months	16.3	31.3
"	4 "	21.6	36.5
"	5 "	21.6	35.5
July 14th	1 day	3.7	3.7
"	1 month	12.1	22.1
"	3 months	16.5	28.8
"	4 "	18.2	30.1
August 11th	1 day	4.3	4.3
"	2 months	17.4	28.3
"	3 "	18.5	29.7

*May cheese were discarded at the end of three months, on account of developing bad flavor.

Although the same quantities of rennet and salt were used in each month's make, and all other conditions were kept as uniform as possible, notice the much more rapid ripening of June, July and August cheese, as

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compared with April and May, both in cold-storage and the ordinary curing-room. With the June and July cheese, kept under ordinary conditions, 22 per cent, of the casein became soluble, whereas only 15 and 14 per cent. respectively became soluble in April and May. It may be said that this rapid ripening of the summer cheese was due to the effect of higher temperature in the curing-room; but the cheese kept in cold-storage, where the temperature never went over 40 degrees F. throughout the whole summer, show the same rapid development.

About the middle of August, the April cheese (A and E) were reversed; A was put into the ordinary curing-room, and E into cold-storage. The effect of this was to increase very rapidly the rate of ripening of A, but there does not seem to have been a corresponding check in the rate of ripening of E. Why, in the case of the April cheese, there should be less casein soluble at the end of 6 1-2 months than there was at 5 1-2 months, is not apparent. The cheese appeared to be moister; but it could hardly have absorbed moisture. Subsequent investigations may throw some light on this point.

Another point worthy of attention, is the rate at which the casein is rendered soluble in the two methods of ripening. Notice that in the April cheese when A was 3 1-2 months old, 13.4 per cent. of the casein was soluble; and that when E was one month old, 15.5 per cent. was soluble. In June cheese, when A was four months old, 21.6 per cent. of the casein was soluble; and when E was one month old 22.7 per cent. was soluble. These, and figures previously obtained, indicate that cheese one month in the ordinary curing-room at about 65 degrees F., will ripen as much as those four months in cold-storage at 38 to 40 degrees F.

The work on these cheese will be continued throughout the winter. In the spring, a cheese will be brought out of cold-storage and placed in the ordinary curing-room. They will be closely watched, and it is hoped in this way to ascertain what effect the changing from a low to a higher temperature has on the quality of the cheese. Upon its completion, a fuller report of this work will be made, in conjunction with Prof. Dean's report on experiments in ripening cheese at a low temperature.

Limestone.

In the process of manufacture of sugar from sugar beets, lime and carbon dioxide are used to precipitate certain solids not sugar in the juice obtained from the beets. The lime and carbon dioxide are prepared by burning limestone in special kilns at the factory. The stone used must be comparatively free from silica and magnesia, because the silica causes what is known as "bridging" in the kiln, and the magnesia clogs the filter clothes and causes trouble in the filter presses. It is, therefore, essential that the limestone used in the factories be almost pure calcium carbonate. The rock of the Guelph formation is dolomite, containing from twelve to sixteen per cent. of magnesia, while much of the rock in the eastern part of the Province contains considerable silica. Both these classes of rock are unsuitable for factory purposes.

During the year, a large number of samples of limestone have been sent to the laboratory for analysis, 42 of which have been analysed. In three quarries, stone of very good quality was found. In a fourth, St. Mary's, the per cent, of silica is high, but otherwise it is good. The composition of the limestone from these four quarries is given in the following table:

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Average of Analyses of Samples of Limestone Rock.

	Insoluble matter and Silica (SiO_2).	Lime. (CaO).	Magnesia. (MgO).	Carbon di-oxide (CO_2).
Amherstburg	0.72	54 78	0.29	42.69
Beachville	0.45	54.45	0.49	42.49
Port Colborne	0.96	53.76	1 03	43.08
St. Mary's	2.67	53.18	.81	41.86

The Wallaceburg and Dresden factories are using stone from the Amherstburg quarry; the Berlin factory is using Beachville stone, and the Wiarton factory that from St. Marys.

Test of Different Varieties of Sugar Beets.

In 1900 and 1901, and again this year, the percentage of sugar was determined in a number of varieties of sugar beets grows on the Experimental Plots at the College. These beets were grown only for feeding purposes, but the list included the very best varieties for the manufacture of sugar. The object of the experiment was to determine the yield and feeding value, as judged by the sugar content of the beet; consequently, they were not cultivated as they would have been for factory purposes, but as roots are ordinarily grown on the farm. The only exception to this was that they were sown on the flat. The percentages of sugar in the beet and in the solid matter of the juice are given in the following table:

Per Cent. of Sugar in Beets Grown for Feeding Purposes.

Name of Varieties.	1901.		1902.	
	Sugar.	Purity.	Sugar.	Purity.
Red Top	10 9	81.5	10.2	81.0
Red Skinned	9.6	78.4	13.8	85.2
White Silesian	14.5	86.9	12.5	75.6
New Danish	11.4	81.6	11.4	84.1
Green Top White	13.6	83.2	13.0	84.9
Lane's Improved	11.6	80.9	12.2	84.2
Champion	9.6	74 2	16.3	90.0
Royal Giant	10.4	83.3	9.5	83.3
Giant Red Half Sugar	9.6	85.0	10.2	82.3
White French	14.4	83.5	9.5	80.5
Giant White Half Sugar	9 0	74.7	10.1	81.5
Pitzscheke's Elite	15.8	82.6	14.6	88.9
Jersey	15.6	88.7	12.8	87 7
French Yellow	13.3	85.2	13.0	86 9
Carter's Nursery	16.1	87.6	10.0	80.9
Improved Imperial	16.3	86.4	15.6	90.8
Improved Grey Top	14.9	85.7	15.3	88.6
Queen of the Danes	13.3	84.8	10.3	81 5
Vilmorin's Improved	16.8	88.9	14.4	84.8
Vilmorin's French Sugar	14.0	83.6	16.5	90.3
Mangel Sugar Beet	....	.....	15.6	87.1
Tancred Cream	.....	.....	9.5	80 0
Jarnsahle Victrix	.....	.....	16.1	89.5
Ideal	.....	.....	7.1	70.6
Dieckman No. 1	.....	.....	16.1	87.0
Dieckman No. 2	.....	.....	16.1	88.5
Dieckman No. 3	.....	.....	16.3	88.5
Rubensamen	.....	.....	16.7	88 3
C. Vorstadt	.....	.....	16.7	89.1
Kleinwanzlebener	17.5	89.8	16.3	90.0

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These results should be studied, along with the yield of beets, which will be found in the Report of the Experimentalist, Part XIII. of this volume.

Looking at these results from the sugar-manufacturer's standpoint, the reader will notice that a low percentage of sugar always goes with a low purity, and that high sugar content is associated with high purity. These beets are all excellent for feeding; but, for many reasons, only a few of them are suitable for factory purposes.

Sugar Beet Experiments.

For three years, sugar beet experiments have been conducted on an extensive scale under the direction of the Minister of Agriculture, the object of these experiments being to ascertain the quality and yield of beets that may be obtained from our soil under proper conditions of planting, manuring, cultivating, etc., and, incidentally, to give object lessons in growing sugar beets for factory purposes.

In 1900, these experiments were conducted in the districts surrounding Aylmer, Welland and Newmarket. In 1901, similar experiments were carried on in the neighborhood of Alvinston, Belleville, Berlin, Clinton, Cayuga, Dunnville, Lindsay, London, Mount Forest, Port Perry, Peterborough, Simcoe, Waterford, Walkerton and Whitby. This year, experiments have been conducted in Brantford, Brussels, Guelph, Markham, Orangeville, and St. Catharines. The Renfrew Board of Trade made application to the Minister of Agriculture to have their district included in the list, but at the last moment decided that there was not sufficient interest manifested in it by the farmers to justify them going on with the test.

The general plan of this year's experiments was similar to that of previous years, except that more plots were selected in each district than last year. A four-pound package of seed was given to each experimenter, with instructions to sow it all on one quarter of an acre of land. Every plot was inspected by a competent person to see that the ground selected was suitable and properly prepared, and that the seed was planted at the time and in a manner likely to give the best results. The seed used was an imported German variety, known as the Kleinwanzlebener.

Because the beets must be grown entirely in the ground, and in such a way that they will be forced to mature, we have always insisted that seed be sown on the flat and in rows comparatively close together. The only implement that the ordinary farmer has suitable for sowing on the flat is the grain-drill; and, by closing some of the openings, seeds can be delivered in rows either 14 or 21 inches apart. Owing to the difficulty of working with the ordinary cultivators between narrow rows, we have asked all experimenters to sow from every third spout, thus placing the rows twenty-one inches part. We, however, have found that the drill is not a very reliable implement for this purpose, because, when the ground has been very carefully prepared, the spouts will, even when every precaution is taken, deliver the seed too deep; and if a heavy, dashing rain happens to come before the little plants have made their way to the surface, a thick crust will form, which may prevent the plants from coming up regularly, or may completely destroy the crop. Each year, a number of plots have been wholly or partially destroyed in this way.

It is important that the thinning be done at the proper time, and that the after-cultivation be thorough. To insure this, every plot was visited at

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thinning time, and once or twice afterwards. Besides this, two circular letters of instruction were sent to each experimenter.

Between September 17th and 20th, a sample of ten beets was pulled from each plot and sent to our laboratory for analysis. A second sample of twenty beets was taken during the last week of October. At the time the last sample was taken, the beets from 100 feet of a row were pulled, topped, cleaned, counted and weighed. From the data thus obtained, the average weight of the beets and the yield per acre was estimated. The average results of the analysis of the October samples and the average estimated yield obtained in each district, is given in the following table. The average results of all the districts tested in 1900 and 1901 are also given. In figuring the percentage of sugar in the beet from the percentage of sugar in the juice, the factor 93.5 has been used.

Average Results Obtained in the Several Districts Tested.

Districts.	No. of successful experimenters.	Tared wt. of beets in ozs.	Sugar in juice.	Sugar in beet (93-5 factor.)	Purity.	Estimated yield per acre. Tons & pounds.
Markham	37	18.4	16.5	15.4	88.8	17— 63
Brantford	27	14.6	15.3	14.3	87.6	16—1,142
Brussels	30	19.6	15.6	14.5	86.8	14— 441
Guelph	22	16.8	16.2	15.1	88.2	16— 409
Orangeville	29	16.5	16.0	14.9	88.9	14— 476
St. Catharines	44	16.4	15.7	14.6	88.2	16—1,342
Average of 6 Districts, 1902	189	16.6	16.0	15.0	88.1	15—1,646
Average of 15 Districts, 1901	385	....	16.4	15.3	87.5	17— 495
Average of 3 Districts, 1900	116	18.2	14.4	13.4	85.4	16—1,936

The wet, cold weather of the past summer was not considered favorable to the production of beets of a high quality. It was hoped that September would be bright and dry, in order that the beets might have an opportunity to ripen, but even that month proved wet; consequently, it is most gratifying to be able to report such splendid results. From the results secured elsewhere, I feel sure that, owing to the unusually fine weather of the late autumn, sugar beets improved up to the third week of November, and that had we been able to take another sample at that time, we would have obtained even better results.

One point that is particularly worthy of mention in the above results is the purity of the juice. Some of the Western States may be able to produce beets containing more sugar than ours, but nowhere else on this continent have beets been raised that have so high a co-efficient of purity.

The average yields given above are undoubtedly higher than will be obtained where a large acreage is grown. This, I think, is due to the fact that the quarter-acre experimental plots have received more thorough cultivation. It must be remembered that the sugar beet is a highly-bred plant, and, therefore, requires good care and feeding to produce the best results. Without exception, the best results have been obtained where the instructions given have been followed carefully. In the St. Catharines district, 12 out of 44 plots yielded at the rate of over 21 tons per acre, four gave over 25 tons to the acre, and one reached the tremendous yield of 32 tons per acre. These plots were carefully grown by men who are in the small fruit and mraket garden business, and are accustomed to close, thorough cultivation. Consequently, while the yields just cited and the averages of the several

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districts are higher than will be obtained this year where large acreages are grown for the factories, they serve a good purpose in indicating what can be grown under the most favorable conditions.

This year, some fertilizer experiments were conducted on a number of plots in the Guelph district. Thomas phosphate was applied to one-half of five different plots. The soil of these plots was very uniform, and had been prepared for roots by fall plowing and manuring. Samples were taken from the part of the plot treated with prosphate, and from the part untreated, once each week for four successive weeks. The following table gives the average weight of beets, percentage of sugar, and co-efficient of purity obtained from five plots at four different dates, together with the average estimated yield per acre:

With Thomas Phosphate.

Date of lifting.	Tared beets in ounces.	Analysis of juice.			Average estimated yield of five plots.
		Brix.	Sugar.	Purity.	
September 17th	18.4	16.9	14.9	88 2	16 tons 178 lbs.
October 8th	14.6	17.3	15.3	87.8	
October 14th	14.6	17.9	16.0	89.2	
October 25th	17.8	18.2	16.3	89.2	
Average	16.3	17.6	15.6	88.6	

With no Fertilizer.

September 17th	18.6	17.7	14.9	84.7	15 tons 70 lbs.
October 8th	12.3	17.4	15.3	87.8	
October 14th	16.8	17.9	15.8	87.8	
October 25th	15.1	18.3	16.3	89.0	
Average	15.7	17.8	15.6	87.3	

The effect of the phosphate has apparently been to increase the average weight of the beets decrease the percentage of solids not sugar in the juice, and thus increase the co-efficient of purity and the yield per acre. The yields were estimated in the same way as in the other experiments.

On four other plots, superphosphate, nitrate of potash, and nitrate of soda were tried alongside of no fertilizer. Samples were taken from each of these plots once each week for four successive weeks, and analysed. The beets grown upon the plots manured with superphosphate gave a slightly higher co-efficient of purity, but otherwise there was practically no difference in quality between the beets from the various plots. In all of the plots, the beets improved from week to week in quality. So far, the fertilizer experiments have not proved anything conclusively, except that the phosphatic manures improve the purity of the juice.

It was felt that much practical value would be added to the experiment this year if a number of the experimenters in the various districts could be persuaded to send their beets to one of the factories now in operation, and thus place the test upon a commercial basis. The Ontario Sugar Company's factory, at Berlin, is the most central, and they very kindly consented to take the beets from our experimenters at the price paid to their own growers, viz., four dollars per ton, delivered at the factory. The special freight rate on beets this year is 50 cents per ton for any distance up to 50

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miles, and an increase of practically one cent per mile on each ton for longer distances up to 100 miles. In order that we might get at the actual yields per acre, each plot from which beets were sent was carefully measured. All the beets from this measured area were then placed in a car, divided into as many bins, or compartments, as there were lots of beets to be put in the car. On arrival at the factory, each bin of beets was weighed and sampled for analysis separately, and thus the actual weight of beets and per cent. of sugar in the beet, as determined at the factory, was obtained, and the owners supplied with a cash basis upon which to value their crop. One car, containing the beets from five different plots, was shipped from Markham; two cars, containing twelve lots, from St. Catharines; three cars, containing nine lots, from Brantford; and two cars, containing eight lots, from Guelph. Up to date, the returns on only one car have been received; and it is most gratifying to know that, although the estimated yield of these plots was considerably above the average, the actual returns from the factory give yields which correspond very closely with them. Fuller results of this experiment will be given in a bulletin on the sugar beet work of the year, which is in course of preparation.

It has been stated that the object of these sugar beet experiments is to ascertain the quality and the yield of beets that may be obtained under proper conditions and cultivation. The results of the three years' experimental work prove conclusively that beets of a very high quality can be raised in Ontario, and that large yields can be secured. This is now so well established that capitalists, principally American, have already invested about two and a quarter millions of dollars in erecting extensive plants for the manufacture of sugar from the beet. Four large, expensive factories, with an aggregate capacity of 2,200 tons of beets per day, were built during the past summer, and are now in operation, making sugar for home consumption from home grown material. These four factories are situated at Wiarton, in Bruce Co.; Wallaceburg and Dresden, in the old riding of Bothwell; and Berlin, in the County of Waterloo. Other towns have formed companies, at least two of which are seriously considering the question of establishing factories this next year.

In connection with the cultivation of sugar beets for factories, the labor question has proved a serious one. Owing to the fact that most of the contracts for the growing of beets were not signed until after winter had set in, no special fall preparation was given to the ground; consequently, the farmer started heavily handicapped, and the extremely wet weather of the whole season intensified his difficulty. Some farmers have found to their sorrow that, because the beets are grown so close together, it is not a profitable crop with which to clean a weedy field; others have found that a few acres, well cared for, are more profitable than a large acreage given poor attention. Almost without exception, those men who put in a comparatively small number of acres, such as they could reasonably expect to work properly, have done well and are satisfied with the results. On the other hand, those who put in 75, 100, or more acres have had great difficulty in getting the necessary help, and will have little or nothing left after paying all expenses. The Wallaceburg Sugar Company brought about 70 Belgians from Europe to assist with the work in the beet fields. The Indians of Walpole Island also assisted in the work. The beets for the factories in the Western part of the Province were grown over a comparatively wide area of land, and the scarcity of help was not felt so acutely as it was in the Berlin district. Here a large number of Indians from the Brantford reservation were given employment.

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During the pleasant weather of June, it was comparatively easy to get help for the thinning, as school children went to the fields after school hours and assisted in the work. But in the disagreeable weather of October and November, help was scarce; and had it not been for the long open fall, many acres of beets would have been frozen in the ground. They are, however, all lifted, and the factories are now at work slicing them at the rate of nearly 2,000 tons per day, and turning out a fine grade of white granulated sugar. With the experience gained this year, many difficulties will be overcome, and the question of labor will, no doubt, right itself before long.

Considering the inexperience of the growers, and the unfavorable season, the quality of beets going into the factories is good. The question, "Can beets of good quality be raised in Ontario?" is settled; and the question now before those interested is, "Can the farmer raise beets for the money that the factory owners can afford to pay?" This year's experience will go a long way towards settling this question; but another year or two's work is necessary before anything definite can be said. Comparatively few farmers have as yet received their full returns from the factory; but, so far as I have been able to learn from inquiries among them, many farmers have made money this year selling their beets at $4 per ton. All agree that with the addition of 33 1-3 cents for each per cent. over 12, which the Government has set as the price the sugar companies must pay the second year, if they accept the bonus, the raising of sugar beets will be profitable to them. The question now presents itself, "Can the companies afford to pay this price?" If they can, it would seem as though the introduction of a new industry, drawing its raw material from the farm, is assured. If this industry is a success, it will, without doubt, have a decidedly beneficial effect upon agriculture in general; because, as the good results of the thorough cultivation necessary to produce the highest quality of beets are seen in the following crops, it will naturally lead to better cultivation on the whole farm. Thus agriculture in general will be improved by the introduction of the sugar beet industry.

In conclusion, I wish to acknowledge the assistance of the Dairy and Experimental departments in all the work in which we have been associated during the year.

Respectfully submitted,

R. HARCOURT.

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PART VII.

THE ASSOCIATE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

Sir,—I beg to submit herewith a brief Report of my first year's work as Associate Professor of Chemistry.

Teaching.

During the first four months of this year, my time was almost wholly occupied in teaching. To insure thoroughness in the work in elementary Inorganic Chemistry, the first year students of the regular course perform the experiments for themselves, under my direction. This course of laboratory work is supplemented by lectures, in which the experiments are reviewed, observations made regarding the properties of elements and compounds, and accurate conclusions arrived at. In this, my endeavor has been to make the work as interesting as possible, by drawing the attention of the student to the practical application of the Science of Chemistry to Agriculture.

In the third year, students proceeding to the examination for the B.S.A. degree are given more thorough and advanced work in Inorganic Chemistry. To supplement lectures in this branch, we give a three months' course of Laboratory practice in Qualitative Analysis, in which the principles underlying the grouping and separation of the metals are studied carefully.

The Chemistry taught to the Dairy Class is necessarily of the most elementary nature. The object of this course is not to train men to be chemists, but to give the students of the great Dairy Industry a reading knowledge of books relating to their own line of work; to show them reasons for the changes that occur in milk and its products; and to encourage a spirit of inquiry and thoughtfulness. No attempt is made to fit these men for work in the Chemical Laboratory, but each student is given tests for the most common adulterants and preservatives to be found in milk, butter and cheese; and an opportunity is given each member of the class to exercise his skill in detecting and identifying these.

Since the opening of the College, in September, most of my time has been occupied in teaching and in preparing material for class-work.

I am glad to be able to report that the students of my classes have made very fair progress; also that the conduct of the students in the class-room has been excellent.

Investigations Undertaken.

Ash Constituents of Cereals. In the early years of the past century, the attention of agricultural chemists was directed towards the importance of the incombustible or ash constituents which are found in plants. At first it was believed that these existed in the plants merely as stimulants, and were not directly concerned in building up plant tissues. Further investigations, however, proved that the mineral matter entered into the life-giving protoplasm of plants, and was, therefore, indispensable to the existence of plant life. Later, it has been found that, of the different elements which make up the ash content of plants, there are some which are always present in

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the ash, while there are some which may be present or entirely wanting without affecting the development of the plant. The former have been termed the essential mineral elements; the latter, the non essential constituents.

The methods of ash analysis used by the early investigators were very crude, but as time passed, numerous improvements were introduced, which made it possible for the analyst to obtain more accurate results. Notwithstanding this, the knowledge of ash analysis is still limited in extent, and there is yet room for much painstaking research.

It was for the purpose of determining the distribution of the different ash constituents in the straw and seeds of some of the cereal crops, and also to determine the total quantity of mineral matter taken from the soil by these crops, that the work herein described was undertaken. In this work, I used a new method of ash preparation, described by Dr. Shuttleworth in the College Report for 1899. It has been claimed for this method that fusion of the ash is prevented, thus reducing the error otherwise introduced in the determination of silica. In my experience in burning barley or wheat straw, no fusion of the ash can be detected; but in the preparation of an ash from a cereal low in silica, such, for example, as oat straw, fusion is not prevented by this method. I am strongly of the opinion that some improvement will still have to be made before absolutely reliable results can be obtained in all cases of ash analysis.

Investigation Proper. The material chosen for this work was barley, the samples used having been grown on the Experimental Plots under natural conditions. The grain and straw were treated separately, in order to compare the distribution of the different constituents throughout the plant. The ash was incinerated, weighed, and the carbon-dioxide determined in a platinum dish of Dr. Shuttleworth's design. This dish has a specially constructed top, which prevents the escape of volatile mineral products. (See College Report, 1899, p. 43).

The subjoined tables record the percentage composition of barley ash, as determined by the new method, and also the results of some previous analyses, which are appended for the purpose of comparison:

Grain.	New method.	Wolff.	Zaeller.	43 Analyses.	
				Lowest.	Highest.
Ash in grain	2.19%	2.23%	2.50%	1.8%	2.8%
SiO_2 in ash	9.6	26.00	31.1	21.1	36.7
Fe_2O_3 "	2.4	.....	.7	.1	2.4
CaO "	4.2	2.7	2.7	.7	4.2
MgO "	12 0	8.9	7.0	4.3	14.7
P_2O_5 "	30.2	34.9	32.4	26.0	39.8
K_2O "	26.5	21.0	18.5	13 8	31.6
Na_2O "	23.6	.....	.....	.....	.....
SO_3 "	1.4	.....	.....	.....	.....
Cl "	1.56	.....	.....	.....	.....
Straw.					
Ash in straw	9.7	4.59	5.0	32.0	5.9
SiO_2 in ash	16.7	50.9	59.7	49.9	68.5
Fe_2O_3 "	1.1	.....	1.9	.2	2 0
CaO "	7.6	7.3	7.3	5.8	13.1
MgO "	4.9	2.6	3.0	1.7	3 11
P_2O_5 "	2.1	4.1	6.0	2.2	7.2
K_2O "	38.5	23.8	12.0	10.8	20.9
Na_2O "	25.2	.....	.....	.....	.....
SO_3 "	.45	.....	.....	.....	.....
Cl "	3.2	.....	.....	.....	.....

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It will be observed from the results recorded that the proportion of silica, as determined by the new method, is quite low in comparison with that found by previous methods of preparation and treatment. One-third, and in the case of straw, often more than one-half, of the ash was formerly found to consist of silica. To explain the physiological significance of this mass of so-called silica was extremely difficult. At one time, it was believed that silica was necessary to give rigidity to the straw. This opinion had to be abandoned, however, when it was discovered that the greater part of the silica is stored in the leaves and top part of the stem, showing that it is not there for the purpose of support. It would now seem that there is not nearly so much silica in cereals as was commonly supposed.

Comparing the amount of potash found by the different methods, we notice that the opposite condition of weights exists. The new method, then, gives a high proportion of potash and a comparatively low per cent. of silica. The increase of potash is particularly noticeable in the ash of the straw, which contains the bulk of these two constituents found in the total crop. The results indicate that, with the old method of preparation, a considerable portion of the potash was left in combination with the silica, swelling the quantity of that constituent to undue proportions.

Another noticeable feature of the results recorded in the tables is the apparent lack of uniformity in the composition of ash, as determined by different analysts. The amount of any one element which a plant may contain seems to be a variable quantity. The fourth columns of the tables afford a striking example of variation in the composition of ash. The different amounts of lime, magnesia, and phosphoric acid recorded, which can be determined with perfect accuracy, show clearly that the constituents of the ash vary greatly, even in the same plant. It is evident that the soil upon which the plants are grown, and from which they derive their supply of mineral matter, influences the character of the ash. There must be a minimum quantity of the essential mineral elements provided for the development of plants; it is possible that there is a maximum quantity of each which can be used to advantage by plants; and, further, it is believed that plants can store up in their tissues more mineral matter than is necessary to their growth. This is certainly true in the case of silica, and may be true of other constituents. Just how much of each mineral is conducive to the best development of plants has not yet been ascertained; it is a question which requires further investigation.

Constituents.	Grain.	Straw.	Ratio of mineral constituents in the two parts of crop.
Material	20.320 grs.	34.124 grs.	
Total ash	.446 "	3.337 "	1— 7. 5
SiO_2 in ash	.0427 "	.5674 "	1—13. 3
Fe_2O_3 "	.0107 "	.0367 "	1— 3. 4
CaO "	.0187 "	.2536 "	1—13. 6
MgO "	.0635 "	.1635 "	1— 3.06
P_2O_5 "	.1347 "	.0701 "	1— 0.52
K_2O "	.1182 "	1.2847 "	1—10.97
SO_3 "	.0467 "	.0020 "	1— 0.04
Cl "	.0070 "	.1068 "	1—15.33
Na_2O "	.1053 "	.8409 "	1— 8. 0

This table deals with the total weight of the different ash constituents in the crop, and the distribution of these in the straw and seeds. The bulk of the total ash appears in the straw, and, in consequence, the several constituents of which it is composed are also found in larger quantities in

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the straw. Phosphoric acid is an exception, the greater part of it being stored in the grain. The distribution of the three elements of the ash,—silica, lime, and potash,—is proportionately greater in the straw.

Calculating from the weights recorded in the last table, when a crop of barley yielding 40 bushels per acre is aken off the land, we find that approximately 136 1-2 pounds of potash and 19 pounds of phosphoric acid are removed with it. If the straw is returned to the soil without the loss of any of its mineral matter, about 125 pounds of potash and 6 1-2 pounds of phosphoric acid are replaced, 11 1-2 pounds of potash and 13 pounds of phosphoric acid being removed in the grain.

Of all the mineral constituents, the two above-mentioned are of most importance to the agriculturist, because of the large quantities of these assimilated by plants and the comparatively high cost of replacing them. The extent to which the soil is robbed of its mineral matter when the crop, and more particularly, the straw, is sold off the farm, is here apparent. There is no practice which will deplete the soil of its ash material more quickly than this. What has been stated regarding barley is true, in a greater or less degree, of the other cereal crops examined, and also of grasses. Meadow hay contains a large amount of mineral matter; and, as the marketable product in this case includes both stems and seeds, depletion of the soil in ash material is very great when the crop is continually removed and sold.

The figures relating to the total quantity of potash contained in a crop of barley greatly exceed former calculations; but, as the crop examined was grown under field conditions, the difference in composition must be attributed very largely to the improved method of ash preparation. The large amount of ash found in the straw would appear to substantiate this opinion.

Knowing these facts, the provident agriculturist will not willfully pursue a course which entails the depletion, and in time the complete exhaustion, of the valuable mineral constituents of his soil, unless he has some means within reach of replacing them. Once removed, they can be replaced only by direct application in some form of commercial fertilizer. This is an expensive operation, and one which requires knowledge and skill to carry it out successfully. Therefore, it appears to be the wiser course for the average farmer to husband the resources already in his possession.

Composition of By-Products of Flour, Oat, Pea and Starch Mills.

During the past few years, a great number of questions have been received by the Chemical Department regarding the composition and relative food values of various by-products from flour, oat, pea, and starch mills. As no systematic investigation of these products had been undertaken in Canada, it was thought well to carry on work along this line. For this purpose, the following circular letter was prepared and sent to the proprietors of all mills in the Province manufacturing such by-products:

"Dear Sir,—We are constantly receiving letters of inquiry regarding the composition and relative feeding value of the various by-products of Oat, Pea, Barley, Corn, and Wheat Mills. To answer these questions with any degree of certainty, we think that a systematic chemical analysis of such products is necessary. For this reason, we are sending out a circular letter to the various milling companies throughout our Province requesting their aid in this matter. We should be pleased to have you send us samples of all the by-products of your mill, together with information regarding the method by which the said products are obtained, and the price per ton at the mill. This information, and the results of the chemical analyses, we propose to embody in a pamphlet for general distribution among millers and farmers. Such information, we think, would be of value to millers, dairymen, and stockmen alike, and, at the same time, would greatly assist us in answering questions such as we have mentio ed. We, therefore, hope that you may see your way clear to co-operate with us in this line of work, and, by so doing, you will greatly oblige. Yours truly."

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In reply to this letter, some 90 samples have been received. On account of my absence in Europe during the past summer, the analysis of all of these has not yet been completed. I hope, however, to have this work in shape to report upon in the near future.

Humus Soils. The third line of research upon which I am at present engaged, is the chemical composition of humus soils, and the available plant food contained therein. As there appears to be but a vague idea in the minds of many as to what "humus" really is, I beg to be permitted to say a few words in explanation of this term; also to state, in a brief manner, the value of this constituent of the soil to the growing crop, in order to show the importance of this piece of investigation.

The name humus is familiar enough; but to a very considerable extent, it remains little more than a name. We know that soils are composed of mineral matter, in a more or less fine state of division, but mixed with the mineral matter is found also a small amount of organic, or vegetable, matter, which, exposed to the atmosphere, decays; and its constituents, or gases, escape into the atmosphere or become dissolved in the soil water and leach away. This decay of the organic matter involves its oxidation, to accomplish which it is indispensable that there should be a free penetration of air. The oxidation process may be rapid or slow. Under ordinary circumstances, it is slow; but cultivation facilitates it. When, therefore, we expose the soil to the action of the sun, and keep it exposed by continual and intelligent cultivation, we contribute largely to the oxidation of the organic matter. This substance, because it is decaying, is the measure of fertility; but it ceases to be so as soon as oxidation is arrested. This actively decaying part of organic matter constitutes the value of the whole, and it is this part which is really "humus." Therefore, though a soil may contain large amounts of organic matter, unless it be in a soluble state, it is of comparatively little use to the growing crop.

Many prominent agriculturists consider humus as almost the "banking-house of soil fertility;" and, as a matter of fact, the bulk of nitrogen supplied to the plant is furnished by it. It is also the agent in furnishing to the plant much of the mineral matter, that is to say, mineral matter which exists in an insoluble condition in the soil, unites chemically with the humus when present, and becomes soluble, and, consequently, available. According to Ladd: "Of the average total phosphates existing in a number of soils, 41 per cent. of the phosphoric acid was combined with humus; and when the soils were high in humus, the amount of combined nitrogen reached 61 per cent." From these facts, we are led to believe that the chemical value of humus to any soil is very great. Hence, the necessity for some definite knowledge regarding the composition of humus soils. Moreover, as we have noticed, humus is a soluble substance, and, like other soluble materials in the soil, is under a steady waste. It is either dissipated in the air, or leached away in drain water. To reduce this loss to a minimum is the aim of every intelligent and successful farmer. A knowledge of the composition of such soils will, therefore, greatly assist in attaining this end.

In this particular line of work, I have experienced many difficulties, owing to the fact that some of the methods of determining certain of the constituents of such soils, as described in the "Official Methods of Analysis," are not reliable: others are so vague as to lead to endless trouble and annoyance. Mr. de Coriolis, one of our Fourth Year students, is analysing a number of humus soils; and his experience is similar to my own. We have endeavored to remedy one or two of these defects by devising methods which, in our experience, have obviated some of the errors in this line of analysis. These suggestions, I venture to submit.

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In digesting, use only three grams of the soil. Start with a very low flame, and allow the contents of the flask to heat for about fifteen minutes. At the end of that time, the danger of frothing is over, and the flame may be raised. Just raise it, however, so that the tip will barely touch the flask. Allow it to boil until the liquid is clear, or of a light straw color. Thirty c.c. of concentrated H_2SO_4 is all the acid needed in this digestion, and should be added to the flask at the beginning. A little pumice stone will reduce the bumping. Take care not to add any water before or during the operation. We found that when we added water to wash down the sediment which had adhered to the neck of the flask, bumping was always very severe. This, in fact, is the "bugbear" of the whole of the process in the determination of nitrogen. After digestion is complete, the usual steps may be followed.

In following the method indicated, it is not necessary to decant the clear liquid before distilling, as the sediment is not heavy enough to make decantation indispensable. If ten grams of soil be used, as directed in the official method, decantation is absolutely essential.

Moisture Determination.

Use ten grams of the soil. Weigh on a tared porcelain dish or watch glass (six centimetres in diameter). Place for ten hours in a water-oven, and keep it at the temperature of boiling water; also keep a constant stream of CO_2 passing through the oven. We have used CO_2 instead of hydrogen gas with marked success. CO_2 is much cheaper than hydrogen, and, because of its inertness, is a very good agent to use in preventing oxidation. We have found it utterly impossible to obtain concordant results, if precaution is not taken to prevent oxidation. We have also found it necessary to heat the soil for approximately ten hours, and never allow it to cool during this time, in order to obtain reliable results in moisture determinations.

The humus soils so far examined have been taken from different parts of the College farm. I hope to extend this investigation to other localities as soon as time will permit. As this work was only recently begun, I shall not venture to report on the results. I would merely say that the figures thus far obtained show wide variations in the composition of humus soils. We are growing crops on these soils in our green-houses, and find that the appearance of the crops corresponds very closely with the results obtained by analysis.

Thus, though a chemical analysis of the soil does not solve all the difficulties which practical men meet with in cultivating soils of low fertility, yet the results obtained afford indications that the inquiry may prove of considerable interest when systematically worked out. We hope to have much information in future along this line.

Before concluding, I wish to thank you for leave of absence during the past summer, by reason of which I was enabled to travel and study agricultural conditions in the old land. I believe that the information gained by visiting the various stations in England and the Continent has been of material aid to me, both in the class-room and the laboratory.

Respectfully submitted,

W. P. Gamble.

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PART VIII.

THE PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College:

Sir,—Allow me to submit my Report for 1902.

With the exception of materially shortening the course in Anatomy and devoting more time to more practical subjects, the class-room work has been much the same as usual.

First Year. Lectures and demonstrations to this year, during the fall term, consisted in a brief, but comparatively comprehensive, course in Comparative Anatomy, in which the anatomy of the horse received special attention. Where material differences exist between his anatomy and that of other animals, the attention of the class was drawn to them. I also gave to this class a course of lectures on the building of stables, site, material, drainage, ventilation, the kind and size of stalls, both open and box, slope of floors, arrangement of mangers, etc., the general care of horses, in respect to feeding, watering, grooming, exercising, care of the feet, etc.; also the general care of harness and saddlery.

In addition to the above, I gave a series of lectures on judging horses. In this course we were, as usual, handicapped by not having, for purposes of demonstration, fair specimens of the various breeds or classes. I used those we have, supplied some from my own stable, and borrowed some. During the winter term, I delivered a course of lectures on "Veterinary Materia Medica," in which I discussed the general actions of medicines when administered internally or applied externally; the various methods of administering and applying medicines, with the advantages and disadvantages of each. We considered individually the properties, actions, uses, and doses of the drugs commonly used for the prevention and cure of the ordinary diseases of stock.

Second Year. The class-room work for this year, during the fall term, consisted in a discussion of the causes, symptoms, and treatment of the ordinary diseases of farm stock, with frequent reference to the proper methods of feeding, watering, and general care of stock in order to prevent disease. During lectures, I had, as usual, one of my own horses in the class-room, and explained the difference in appearance between a healthy and a diseased animal. When speaking of disease of an external organ, I point out on the healthy animal the seat of disease, and explain the change in appearance produced by the disease. I have specimens of the different diseases of bone, and am thereby enabled to show the class the changes of structure that occur.

During the winter term, I lectured upon Veterinary Obstetrics. In this course, I discussed the general care of females during pregnancy and after parturition, noting the means of preventing and curing the diseases of both dam and offspring incident to the parturient state, and giving special attention to the care of the young. In all cases, when possible, I illustrate these lectures with charts.

A course of lectures or demonstrations called "Practical Horse" was also given. In these I demonstrated with a living horse, the best methods of securing an animal for minor operations, such as lancing abscesses, dissecting out tumors, dressing and stitching wounds, and firing for spavin, ringbone, and kindred diseases; the different methods of castration, dressing teeth, scarifying lampas, administering and applying medicines, passing

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a probang in the ox, puncturing an ox in case of excessive bloating, etc.

I also gave a full course of lectures in judging horses, using those we have on the farm and in my own stable, borrowing some, and taking the class to the farms of local breeders.

Third and Fourth Years. To these classes I gave lectures on the various breeds and classes of horses and on judging horses. Some members of these classes competed in the judging classes at the International Exhibition in Chicago last December, and one of them won first place in horse-judging. To the special Dairy Class I delivered a short course of lectures on the prevention and cure of the ordinary diseases of dairy stock.

During the special course in Stock Judging, held in January, I lectured to the classes on judging horses. I take this opportunity of publicly expressing my thanks to the breeders and owners of horses in Guelph and vicinity, who were not only kind enough to lend me their animals, but sent attendants with them to the class-room. I refer particularly to Messrs. Sorby, Bowman, Tovell, Palmer, and Cunningham. In this course, we worked at a great disadvantage in not having sufficient class room for either the class or the animals. This drawback will no longer exist, as the judging pavilion now under course of erection will, doubtless, be completed in time for the course next January. The members of both sections of this class last January expressed in flattering terms their satisfaction and appreciation of the work, and we hope (now that the conditions will be all that can be desired in the way of accommodation, and we have learned from experience more about how to conduct such a course) to be able to make the course more instructive and entertaining, and, hence, more fully to merit the appreciation of the class.

Diseases and Ailments of Stock

In addition to the class-room and practical work mentioned, I gave professional attention to the stock of the Institution. I am pleased to be able to state that the losses were few.

Horses. We had several cases of colic, indigestion, influenza, laryngitis, lymphangitis, colds, sore shoulders, sore necks, scratches, mud fevers, lameness from different causes, etc., all of which recovered.

In January, a vicious mare in the College stable, while in harness, commenced to kick and ran away. The shaft broke, penetrated the abdomen, and wounded the intestines, which protruded, and she had to be destroyed.

In October, an old horse belonging to the experimental department, while in the field at liberty, ran against a wire fence, fell over it, and broke his back, which necessitated his destruction.

Cattle. We had a few cases of parturient apoplexy, a few difficult parturition, several of retention of the placenta, inflammation of the udder, sore teats, impaction of the rumen, bloating, fardel bound, obstruction of the milk ducts, diarrhoea, inappetence, lameness, etc., all of which yielded to treatment. We had one fatal case of lung trouble in a shorthorn bull calf.

Sheep. We had little sickness in sheep, and no losses, except two or three lambs from wool-ball in the stomach.

Pigs. We lost some pigs in the experimental stables from inflammation of the lungs, the cause of which is hard to determine. With the exception of some newly-born ones, this was the only fatality.

I have, Sir, the honor to be,

Your obedient servant,

J. H Reed.

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PART IX.

THE PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College:

Sir,—I beg leave to submit my Twelfth Annual Report from the Dairy department. The work done during the year may be classed as follows: Lectures and practical work given to the College students, lectures and practical work given to the special Dairy Classes, experimental work relating to milk, cheese, and butter. The lectures and practical work of the first year relate to Farm Dairying, and those of the second year to co-operative Dairying. The Dairy Specialists in the final year take advanced work, and study three text-books.

Milk and cream to the value of about $1,000 has been supplied to the College during the past year, and our cash revenue will be lessened by about that much.

The Dairy School.

For the three months' course, 88 students registered. During the summer, eight students came for special instruction in butter-making and Pasteurization of milk. For the Creamery Course, in December, thirteen students have registered up to the time of writing. In the Domestic Science Course, 96 ladies registered, in addition to the lady students of the Dairy School. There was a special lecture given by Mrs. Jean Joy, of Toronto, who gave the Domestic Science lectures to the Dairy Class, to the farmers' wives in the locality, which was attended by a large number of ladies from the farm. The total number who registered during the year for special Dairy and Domestic Science instruction was 205.

At the end of the long course in Dairying, 39 students wrote on the final examinations,—27 for the full factory course, three as specialists in butter-making, and nine in the Farm Dairy. All passed their examinations successfully, and those who had factory experience before coming to the Dairy School were granted their Certificates of Standing. Those in the Farm Dairy, with farm experience, were also given Certificates of Standing.

During the year, the following have been granted Diplomas or Professional Certificates:

Butter-making—C. W. McDougall, Grenfell, N.W.T.; H. W. Parry, Compton, P.Q.; D. A. James, Lakelet; J. W. Gibson, Arnprior; J. R. Hutchinson, St. George.

Cheese-making—J. H. Thompson, Laurel; Chas. Atwood, Arkona; J. F. Singleton, Newborough; Carmon Ball, Clarence; Albert Barberree, Quincey. Minnesota, U.S.A.

I take this opportunity of thanking the Instructors of the Dairy School for their co-operation, and especially Messrs. Stratton and McFeeters, for their careful work as Instructors and in carrying on experiments during the summer. Professors Harrison and Gamble, of the College Staff, by their lectures and practical instruction in Dairy Bacteriology and Dairy Chemistry, added much to the profit and interest of the School.

For 1903, we shall continue the features of 1902, and add Instruction in Boilers and Engines, and practical instruction in piping and repairing, a shop having been provided for that purpose.

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A special course for those who are, or who wish to become, Instructors will be given in April, 1903, as well as a special summer course of instruction in butter-making, cheese-making, and pasteurization of milk.

Milk for Household Purposes.

The preparation and care of milk for table use has been the subject of considerable discussion during the past few years. The establishment of dairy companies in many of the cities and large towns of Canada has made this subject of live importance. In some places, a great deal of stress is laid upon "clarifying,"—a process by which milk is passed through a cream separator, or centrifuge, to clarify or cleanse it. The centrifugal force removes most of the heavy albuminous matter and the dirt which may be in the milk, as it passes through the bowl of the centrifuge. This substance remaining upon the inside of the bowl is known as "separator slime," "separator mud," etc.

In other dairies, pasteurization is considered the proper treatment for milk, in order to prepare it for the table or for other uses as a food. By pasteurization is understood the heating of milk at a temperature between 140 and 185 degrees, and afterwards cooling it.

Some dairies rely upon filters made of sand and cotton, cotton batting, or other filtering material. The filter used by the Copenhagen Dairy Supply Co., Denmark, consists of sand and cotton; while in American and Canadian dairies it is usually made of special cotton batting used for this purpose. The batting is used but once, and then destroyed.

One of the difficulties we met with at the outset in studying this question was to arrange a scale of points for judging the milk treated by the different methods. So far as we know, an exact system of judging milk has never been devised. It was not sufficient for our purpose simply to say that one sample was better than another. We wished to know in what respects it was better. In the first series of experiments, conducted during April and May, the following score-card was used: Smell, 20; taste, 25; acidity, 30; cream, 15; appearance, 10; total, 100.

In the second series, conducted during July, August and September, the scale was changed so as to give more prominence to acidity (sourness). Our reasons for this change were that the sweetness of milk is a very important point in judging of its value for food; and, secondly, that the acidity could be measured exactly, and a correct valuation placed upon it, as expressed by mathematical terms. Our final scale gave 35 points to acidity, and only five to appearance. During the first series, milk containing .1 per cent. or less of acidity was given full points, or 30 out of 100, and each increase of 1-100 of a per cent. of acid decreased the score one point. For instance, milk testing .1 per cent. of acid received a score of 30 points, but milk showing an acidity of .15 scored but 25, and milk with an acidity of .3 or over, received nothing under this head.

In the second series, during which "acidity" received a maximum score of 35, the scoring for acidity was made according to the following scale:

Milk containing		Acid received	
less than	.14%	35	points
"	.15%	34	"
"	.16%	33	"
"	.17%	32	"
"	.18%	31	"
"	.19%	30	"
"	.20%	28	"
"	.21%	26	"
"	.22%	24	"

Milk containing		Acid received	
less than	.23%	22	points
"	.24%	20	"
"	.25%	18	"
"	.26%	15	"
"	.27%	12	"
"	.28%	9	"
"	.29%	6	"
"	.30%	3	"

Above .3 per cent. acid, no points were allowed.

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It will be observed that in this second scale, each increase of 1-100 of a per cent. of acid in the milk from .15 to .2 decreased the score by one point. From .2 to .25 per cent. of acid, each increase of 1-100 of a per cent. of acid decreased the score by two points; and from .26 to .3 per cent. of acid, the score was decreased three points for each increase of 1-100 per cent. of acid in the milk. It is believed that this scale more nearly represents the commercial value of milk.

In the first series, the milk, previously well mixed in a vat, was divided into six different lots; and, in the second, into seven different lots. Samples were taken in sterilized pint milk bottles for scoring purposes. The samples were marked "normal," "clarified," "Pasteurized at 140 degrees," "clarified at 140 degrees." "Pasteurized at 160 degrees," "clarified at 160 degrees," and, in the second series, one sample was labelled "filtered." They were then placed in a refrigerator at a temperature of about 40 degrees for twenty-four hours, when they were scored the first time, after being brought into a room at a temperature of about 70 degrees for about three hours before being scored. They were then left in this room, except in a few cases where they were returned to the refrigerator, for another twenty-four hours, and scored the second time. The object of doing this was to imitate conditions in a milk dairy, and after delivery to the customers, or consumer. The milk was partly from our own herd and partly that delivered by patrons of our Creamery. The following table shows the average results in both series:

Table Showing the Scoring of Milk Treated by Different Methods.

Series.	Kind of Milk.	Scoring.	Smell. Max. 20 Av.	Taste. Max 25 Av.	Acidity. Max. 30 and 35 Av.	Depth of Cream. Max. 15 Av.	Appearance. Max. 10 and 5. Av.	Total. Max.100 Av.	Per cent Acid. Av.
I. April and May.	Normal	1st score..	13.3	16.8	11.1	14.7	9.6	65.5	.29
		2nd " ..	6.4	7.1	0.8	14.5	9.7	38.6	.64
	Clarified	1st " ..	12.2	16.3	12.6	12.6	6.2	59.5	.278
		2nd " ..	7.1	8.2	0.8	12.4	6.0	34.4	.600
	Pasteurized at 140°	1st " ..	16.7	21.3	20.2	13.5	9.0	80.7	.19
		2nd " ..	13.5	16.5	14.7	13.6	9.3	67.6	.22
	Clarified at 140°	1st " ..	14.9	19 0	15.9	12.0	5.9	69.0	.214
		2nd " ..	9.9	11.7	5.6	12.5	7.7	47.6	.342
	Pasteurized at 160°	1st " ..	18.2	22.1	20.9	6.3	8 5	76.3	.18
		2nd " ..	15.8	19.5	19.6	6.1	8.6	69.7	.145
	Clarified at 160°	1st " ..	17.5	21.7	21.5	5.9	7.0	73.8	.223
		2nd " ..	14.6	17.9	19 8	5.7	7.1	65.1	.196
					Max. 30		Max. 5		
II. July, Aug. and Sept.	Normal	1st score..	15.2	15.6	9.1	15.0	4.6	62.1	.397
		2nd " ..	3.0	2.8	0.0	15.0	4.5	25.3	.540
	Clarified	1st " ..	14.5	15.0	10.7	13.0	3.6	56 9	.397
		2nd " ..	3.1	2.4	0.0	13.6	3.8	23.1	.56
	Filtered	1st " ..	15.6	15.3	9.6	14.4	5.0	59.8	.415
		2nd " ..	3.1	2.8	0.0	14.1	4.8	25.0	.54
	Pasteurized at 140°	1st " ..	19.6	24.0	21.3	12.7	5 0	82.7	.228
		2nd " ..	10.6	10 8	8 8	12.4	5.0	47.8	.298
	Clarified at 140°	1st " ..	18.7	22.5	19.2	14.1	3.6	78.2	.225
		2nd " ..	10.3	8.3	7.6	13.8	3.6	43.8	.38
	Pasteurized at 160°	1st " ..	19.7	23.8	27.5	8.0	4.7	83 8	.21
		2nd " ..	12.5	14.5	19.1	7.8	4.6	58.5	.24
	Clarified at 160°	1st " ..	19.1	23.8	25.5	7.5	3.7	79 8	.21
		2nd " ..	12.0	12.3	12.3	7.1	3.8	47.8	.266

Comments on Table. 1. It will be noticed that the "normal," "clarified," and "filtered" samples decreased in value very materially in "smell," "taste," and acidity"—at the second scoring. Pasteurizing at 140 degrees and clarifying at 140 degrees gave better results, while the highest scores

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in these three points at the second judging were obtained in the lots pasteurized and clarified at 160 degrees. For "depth of cream" and "appearance," the normal and clarified samples lead in both scorings.

2. The highest average first score of the first series was obtained by the lots pasteurized at 140 degrees; the highest average at the second scoring was obtained by the lots pasteurized at 160 degrees.

3. In series II., the highest average at the first scoring was obtained by the lots pasteurized at 160 degrees, although there was not much difference (1.1 points) between the first score of these and of the lots pasteurized at 140 degrees. However, at the second scoring (24 hours after the first), the difference in the score was 9.6 points, showing that the samples heated to 140 degrees deteriorated much more rapidly than those heated to 160 degrees.

Conclusions. 1. For customers, who judge the value of the milk by the depth of cream and by its appearance, normal and clarified milk will suit best, as the pasteurization of the milk prevents the cream from rising, and the bottle of milk does not present so pleasing an appearance. On the other hand, those who desire milk to remain sweet for 24 to 48 hours after delivery, especially if no refrigerator is convenient, and who wish to insure against disease germs in the milk, will find the pasteurized milk much better, especially that heated to 160 degrees. There is, however, a slight cooked taste on the milk heated to 160 degrees, which those unaccustomed to this flavor might find objectionable. The question of the digestibility of pasteurized milk, as compared with that not heated, is one on which authorities are divided, the weight of testimony being in favor of unpasteurized milk. Some recent observations made in New York city would seem to reverse the opinions held formerly regarding the effect of pasteurized milk when fed to infants. The only way to settle this question definitely would be to conduct experiments with pasteurized and unpasteurized milk fed to human beings. Here is an opportunity for some one to make a sacrifice for the benefit of science and mankind.

2. While the scorings do not indicate any advantage from clarifying or filtering, we should not care to say that these were useless. Undoubtedly, a great deal of dirt is removed from milk by running it through a centrifuge, or by filtering through cotton batting, but the benefits of these may possibly have been exaggerated, where care has been taken in producing and handling the milk.

Testing of Cream at the Cream-Gathering Creamery.

The test commonly used at cream-gathering creameries is that known as the "oil-test." In the oil-test, each patron's cream is measured in what is known as a "driver's" pail, which is twelve inches in diameter. One inch in depth of cream in such a pail is known as "a creamery inch." If it tests 100 per cent. of "butter oil," it is known as a "standard creamery inch." The oil is measured in glass tubes, made for the purpose, after the samples of cream have been churned in a test-churn. It is supposed that each "standard creamery inch" will make one pound of butter; but butter-makers have considerable difficulty in making their "oil-tests" agree with the butter actually churned. While the oil-test, in the hands of a skilful operator and with careful cream-haulers, is a fairly reliable test, there is no doubt that the Babcock test is much more accurate.

One difficulty in conection with the Babcock Tester is the fact that it has been considered necessary to weigh each patron's cream, and this has necessitated the carrying of a pair of scales, which is inconvenient, unless

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the "spring" balance is used. The spring balance, however, is very liable to get out of order, and is not a legal scale.

Experiments were conducted during the past season to find out the relation in weight of cream, testing from 15 to 40 per cent. fat, to an inch of cream." The cream during July, August, and September was divided at various times into five groups,—Group 1 contained cream testing from 15 to 20 per cent. fat; group 2, from 20 to 25 per cent. fat; group 3, 25 to 30 per cent. fat; group 4, 30 to 35 per cent. fat; and group 5, 35 to 40 per cent. fat.

The table below shows the results of 23 tests:

Percentage of fat in the cream.....	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40
Lbs. cream per creamery inch....	4.19	4.15	4 10	4.10	4.07

It will be noticed that the first group weighed an average of 4.19 lbs. per inch; the second, 4.15 lbs. per inch; the third and fourth, 4.1 lbs.; and the fifth, 4.07 lbs. per inch.

As the percentage of fat increased in the cream, the weight of the cream per inch decreased slightly, as we should expect, because fat is lighter, or has a less specific gravity, than the skim-milk which is so large a part of thin, or low-testing, cream. Owing to the fact that thin cream is more difficult to churn, that it costs more per pound of butter for hauling and for manufacturing, and also because the patron who sends cream with a low percentage of fat is losing valuable food material, we would recommend a standard of 4.1 pounds per inch of cream, and that the cream be measured instead of weighed, owing to the greater convenience.

The drivers may still use their cases and sampling bottles for cream; but, instead of churning them at each time of delivery, as in the oil-test method, these samples may be examined by the butter-maker to note flavor, acidity, etc., then be put in a labelled pint bottle having a preservative made of seven parts of bi-chromate of potash and one part corrosive sublimate. The composite sample may then be tested weekly, once in two weeks, or once a month. Some samples were kept in this way for three months during the past summer, and were successfully tested for fat at the end of that time by the Babcock method. Samples of both sweet and sour cream were treated in this way with good results.

Special cream bottles reading from 30 to 50 per cent. fat, were used for testing. An ordinary Babcock bottle may be used, by first diluting the cream with twice its volume of water, or by using a 6.04 c. c. pipette,—measuring one pipette of cream and two of water into a bottle. Then proceed in the usual way as for testing milk, except that in most cases it is advisable to use slightly less acid than for milk.

If testing of cream for fat contained becomes the method adopted by cream-gathering creameries, then the basis of payment to patrons will be the fat, instead of butter, as estimated by the oil-test churn. This plan is likely to be popular with the patrons, as the price per pound of fat is always greater than the price per pound of butter, because a pound of milk or cream fat will make more than a pound of butter. The increase is usually from twelve to fifteen per cent. in milk, and fifteen to twenty per cent. with cream.

Pasteurization of Milk for Butter-making.

This is a continuation of the work done in previous years. A vat of milk was thoroughly mixed, and one-fourth of it was separated at a temperature of 85 degrees. Another fourth was separated at 140 degrees,

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another at 160 degrees, and another at 180 to 185 degrees. Each lot of cream was ripened and churned separately, and the butter was put into cold storage at a temperature of about 40 degrees. This experiment was made in the month of May, and repeated once a month during the next three months. The butter was scored at the end of about one month, again in two months, and again when three months old. The quality of the butter stood in the order of the temperature to which the milk was heated. That made from milk heated to 180 degrees was best in quality, that heated to 160 degrees was second, that heated to 140 degrees stood third, and the butter made from milk heated to ordinary temperature for separating was poorest. These results confirm the experiments of former years; so we shall probably not continue them any further at present.

Conclusion. Butter made from milk heated to 180 to 185 degrees possesses undoubted keeping qualities not obtained by separating at ordinary temperatures, nor by heating to temperatures ranging from 140 to 160 degrees. For export butter, pasteurization of the milk or cream at a temperature of from 180 to 185 degrees is a decided advantage. Pasteurization is also advisable when making butter to place in cold-storage.

Temperature for Ripening Cream.

The best temperature at which to ripen cream has been the subject of much discussion. The work done this past year is a continuation of experiments made in previous years. The temperatures used were 55, 65, 70, 75, and 80 degrees. Altogether 44 trials were made at the different temperatures. The highest average score for flavor was obtained by the butter made from cream ripened at 65 degrees, although there was not much difference in the quality of the butter made from cream ripened at temperatures from 55 to 80 degrees. Ripening takes place more quickly at the higher temperature, and it is probably a question of convenience. The buttermaker who wishes to ripen his cream quickly may adopt a ripening temperature of 70 to 80 degrees with satisfactory results, while he who can control temperature and take plenty of time, have all the conditions favorable for cream ripening, will get good results by ripening at 55 to 60 degrees, but a temperature of 65 degrees has given us, all things considered, the best all round results.

Percentage of Acid in Cream for Butter-Making.

Experiments were conducted during the summer to determine the effects of "high" and "low" acid in cream on the quality of the butter produced from such cream. The lots of cream were divided into four groups, containing .4 to .5 per cent. of acid in the first, .5 to .6 in the second, .6 to .7 in the third, and .7 to .8 in the fourth group. The table shows the average of the first and second scores in flavor, and also the average of these two scorings in each group. The first scoring was made when the samples were two weeks to a month old, and the second a month later.

Percentage of acid in cream.	Scorings of butter for flavor (Max. 45).		
	1st score.	2nd score.	Average of the two scores.
.4 to .5 per cent	42.2	40.5	41.3
.5 to .6 "	41.7	40.8	41.2
.6 to .7 "	42.0	39.6	40.8
.7 to .8 "	41.8	39.7	40.7

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Conclusion. There was not much difference in the flavor of the butter in the different groups at the first scoring, but at the second scoring the samples made from cream with high acidity appeared to lose flavor more than those with low to medium acid, .4 to .6 per cent. It is altogether likely that the acid may vary considerably in cream without materially affecting the quality of the butter. For "keeping butter" it is not advisable to have more than .6 to .7 per cent. acid in cream testing 25 to 35 per cent. fat.

Different Percentages of Fat for Butter-Making.

Thirty-two trials were made of cream testing from fifteen to forty-five per cent. fat to determine the difference, if any, in the quality of butter. The average score for flavor in the butter made from cream testing 15 to 20 per cent. fat was 40.8; cream testing 20 to 25 per cent. fat produced butter with a score of 41.0; butter from 25 to 30 per cent. cream scored an average of 40.9; 30 to 35 per cent., 40.6; 35 to 40 per cent., 41; and 40 to 45 per cent., 40.5 out of a possible 45. There was also not much difference in the "keeping quality" of the butters from the lots. The samples made from the thin cream (15 to 20 per cent. fat) lost an average of one point in flavor by keeping one month, while the lots from 20 to 25 per cent. cream lost 1.8 (one and eight-tenths) of a point, and the rich cream lots lost from one to two points in a month by keeping. What difference there was in this respect was not in favor of the butter made from the rich cream, as is commonly supposed, but slightly less acid was developed in the rich cream at churning time.

Conclusion. Here, again, the butter-maker may be allowed considerable latitude as regards the percentage of fat in the cream; but cream having 25 to 35 per cent. fat gives good results, when the conditions are favorable for churning. On the farm, where cream is churned in small churns, from 20 to 25 per cent fat in the cream is satisfactory.

Moisture and Salt in Butter.

This work is a continuation of that done in 1900 and in 1901. The points investigated this year relate to the effects on the moisture and salt content of finished butter: Churned to the size of wheat and corn grains; washing with brine and with ordinary water; working butter once, twice and three times; no salt, salting one-half ounce, and one ounce per pound of butter; draining one hour before salting, and not draining the butter before salting; and working the butter slightly (five revolutions of worker) before salting. The average results are shown in the following table:

Kind of Butter.	Average per cent. of moisture.	Average per cent. salt in	
		Butter.	Drainings from Worker.
Butter churned to size of wheat grains	14 197	3.95	
" " " corn grains	14.182	4.24	
" washed with brine	14.925	3.90	
" " " water	14.858	4.20	
" drained one hour before salting and salted ½ oz. per lb. of fat	14.306	3.18	27.54
" not drained, and salted one oz. per lb. of fat.	15.155	3.62	30.15
" without salt	13.239		
" salted ½ oz. per lb butter	12.996	1.84	
" " 1 oz. " "	13 562	3 64	
" worked once, 27 revol. worker.	12.511	3 65	
" " twice 18 plus 9 revols. worker	12.246	3.31	
" " three times (9 plus 9 plus 9 revols. of worker)	11.759	2.62	
" " 5 revolutions of worker and salted ½ to ¾ oz.	13.791	3.41	24.80
" " 35 " " " 1 ounce..	13.995	4.06	24.92

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Conclusions. 1. There was little or no difference in the moisture and salt contents of the butters, whether churned to the size of wheat or of corn grains.

In 1901, the samples churned to the size of corn grains contained the highest percentage of moisture and salt.

2. The moisture and salt in the finished butter was very similar, whether washed with brine or with water. There was also little or no difference in the quality of the butter.

3. The lots drained before salting at the rate of 3-4 oz. salt per pound of fat in the cream, contained less moisture and within one-half of one per cent. the same amount of salt as lots not drained and salted one ounce per pound of fat in the cream.

4. The unsalted samples contained an average of 13.239 per cent. moisture. Those salted at the rate of one-half ounce salt per pound butter contained 12.996 per cent. of moisture, and 1.84 per cent. salt. The lots salted one ounce per pound of butter contained an average of 13.562 per cent. of moisture and 3.64 per cent. of salt.

In 1901, the unsalted butter contained the least moisture, in 1900 the most moisture, and this year it takes a medium position. The results indicate that the moisture content in unsalted butter is not necessarily higher than that in similar butter salted.

5. Butter worked once, twice and three times contained respectively, 12.541, 12.246, and 11.759 per cent. of moisture; and 3.65, 3.31 and 2.62 per cent of salt.

6. Samples worked slightly before salting, and then salted from one-half to three-quarters of an ounce per pound of butter, had 13.791 per cent moisture, and 3.41 per cent. salt; while similar lots treated in the usual way and salted one ounce per pound of butter contained 13.995 per cent. moisture, and 4.06 per cent. salt.

7. The amount of moisture in the finished product is largely determined by the working which it receives. The salt depends upon the amount of salt added, the moisture in the butter at the time of adding the salt, and the amount of working given to the butter.

Exporting Butter in Pound Prints.

We made a small shipment of one-pound and half-pound prints of butter to a firm in Liverpool, Eng., in September. They reported, "Some of the pound packets were absolutely perfect—nothing better could have been desired." "The half-pound squares were very much tasted through exposure of the wood, and some of them were inclined to be a little fishy."

As the shipment of pound and half-pound prints was all from the same churning, and all were packed exactly alike, except for the difference in size of the prints, there could not have been very much difference in the quality of the butter. However, we hope to make some further shipments of butter in pound prints at an early date, and expect better results, as there is a good demand in England for fresh butter, in the form of pound squares, salted one-half to one per cent. of salt. The lot shipped was salted one-fourth oz. salt per pound of butter. We kept one or two prints of the lot in our refrigerator for two months, and the quality was good at the end of that time. No preservative other than salt was used in the butter.

Experiments in Cheese Making

In addition to the experiments herewith reported upon, a good deal of work was done with ripening (curing) cheese in an ice cold-storage at a temperature of about 40 degrees, and, comparing this with similar cheese

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ripened in an ordinary room at about 65 degrees. Cheese were also moved from the ordinary curing-room to the cold-storage at the end of one and two weeks, while duplicates were ripened in the ordinary room and in the cold-storage for the ripening period. Other lots were moved from the cold-storage into the ordinary room at the end of one, two and three months to see the effect of taking cheese from cold-storage into a room of much higher temperature. Experiments were also made to determine the effect of a change in the method of manufacturing, in order to produce an increased yield of cheese. A part of these cheese were ripened in cold-storage, and the remainder in an ordinary curing-room. The results of this work are not ready for publication at the time of writing. We hope to have them ready early in the spring, when they will probably be published in bulletin form. I may anticipate the report by saying that, up to the present time, the work confirms that done in 1901, and indicates that a very much lower temperature for ripening cheese may be adopted, with satisfactory results, and with a very much improved quality of cheese. The past season has demonstrated in a very forcible way the value of a cool season for the cheese trade. If we cannot get cool conditions naturally, we must supply them artificially.

Heating Over-Ripe Milk to 110 Degrees at Cooking.

Several trials were made during the summer to note the effects of cooking curds from "over-ripe" milk to a temperature of 110 degrees, instead of 98 degrees, as is commonly done. Fortunately, the season was an unfavorable one for securing "fast working" milk, hence the tests were not numerous enough to warrant us in drawing conclusions of a positive nature. However, the experiments made indicate that for over-ripe milk, this method of heating to 110 degrees would give very good results, especially when combined with washing the curd after milking, to remove the excessive acid in such curds. It was noticed that the flavor and texture of the cheese were better, as a rule, where the curds were heated to 110 degrees; but there was a strong tendency for the curd to mat together at dipping time, after being heated to the higher temperature. The cheese had a tendency to be open, and lacked that closeness which is desired in a well-made Cheddar cheese. Further experiments will be made next year.

Washing Curds.

These experiments are a continuation of those made in 1900 and 1901. The fact that "washing curds" is recommended to cheese-makers as an essential part of the process of cheese-making, is our reason for continuing this work. The experiments this year may be divided into two series: Series I. relates to the effects of washing curds after dipping (a) with a quantity of water, at a temperature of 98 degrees, equal to the weight of the curd; and (b) with a quantity of water equal to twice the weight of the curd, at a temperature of 98 degrees. Series II. was a similar experiment, except that the curds were washed after milling.

In Series I. nineteen experiments were made in July and August, with curds from milk testing an average of 3.7 per cent. fat. The average score of the cheese from curds washed with a quantity of water equal to the weight of the curd after dipping was 90.4 out of 100. Those not washed scored an average of 90.3 points. The loss in weight during ripening (or curing) was 3.64 per cent. on those not washed, and 3.71 per cent on those washed.

Washing with water twice the weight of the curd gave results as

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follows : A score of 92.3 and 3.48 per cent. lost in weight, compared with a score of 91.8 and 3.65 per cent. lost in weight while curing, for those not washed.

In the second series, which extended from May to November, nineteen curds were washed after milling, with a weight of water equal to the weight of the curd and the same number were washed with a weight of water equal to twice the weight of the curd. The results were:—

1. All the lots lost about the same percentage, viz., 3.6 in weight while curing.

2. There was practically no difference in the quality of the cheese, whether the curds were washed or unwashed, or whether washed with a quantity of water equal to the weight of the curd or twice its weight of water. The average scores for flavor and total were as follows:—

Kind of Curd.	Av. Flavor. (Max. 40)	Av. Total. (Max. 100)
Unwashed	34.31	89.05
Washed with equal weight of water.	34.42	88.93
Unwashed	35.05	90.10
Washed with twice weight of water.	35.10	89.90

Conclusion. After three seasons of careful work, we find it no advantage to wash all curds, and it tends to cause loss of valuable cheese-making material. It also tends to produce "open" cheese. Curds having a bad flavor or those having too much acid are benefited by washing, but to advise the washing of all curds we consider a mistake on the part of those advocating this method.

Moisture and Salt in Curd and Cheese.

During May, July, and August determinations were made of the moisture in curds at "dipping" and "milling," and of the moisture in green and ripened cheese. The A lots were made with the expectation of retaining an extra amount of moisture in the curd and in the green cheese. Rennet, at the rate of 6 ounces per 1,000 lbs. milk, was used in these lots; most of them were cooked at 90 degrees instead of 98 degrees; and salt was applied at a lower rate, usually one-half pound less of salt per 100 lbs. curd. The lots marked B were treated in the usual way.

The amount of moisture in the curd and cheese and the salt in the green cheese are shown in the following table. This work is to be regarded as preliminary, and we hope to continue it with more cheese next year.

Month.	Variation in method of making.	Average per cent. moisture in				Per cent. salt in green cheese.	Per cent. fat in green cheese.
		Curd at "Dipping."	Curd at "Milling."	Green cheese.	Cured cheese.		
May—							
2 Expts.	A—6 oz. rennet & cooked 91°.	53.582	41.947	34.706	34.500	1 76	....
July—	B—Normal.	52.110	39.899	33.736	33.070	1.82	....
3 Expts.	A—6 oz. rennet	52.189	40.364	33.106	.....	1.48	37.8
Aug.—	B—Normal.	53 084	41.660	33.166	.....	1.48	39.0
2 Expts.	A—6 oz. rennet, cooked 91°, 2¼ lb. salt.	53 551	43.916	40.768	34.500	1.17	36.4
	B—Normal and salted 2¾ lbs. per 100.	53.396	43.169	37.581	34.07	1.12	37.4
Av. 7 Expts.	A	52.976	41.831	35.752	.....	1.47	....
" 7 "	B	52.895	41.588	34.592	.....	1.47	....

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Ripening (or Curing) Cheese in the Dark and in the Light.

These experiments are a continuation of those made and reported upon in 1901. Eighteen different lots of cheese were made between June 10th and July 16th. One-half of the cheese in each lot was put in a well-lighted room, which was at an average temperature during the ripening (or curing) period of 64.8 degrees, and the air of the room contained an average of 81.8 degrees per cent of moisture. The other half of the cheese were placed in a dark room where there was no light except when the door was opened. This room was kept at an average temperature of 64.4 degrees and had 82.9 per cent. of moisture in the air.

The average score of the cheese ripened in the light room was 90.44 points out of 100. Those in the dark room scored an average of 89.94 points. Those in the light room lost an average of 3.76 per cent. in weight during one month, and those in the dark room lost an average of 3.72 per cent. in weight during the same time.

Conclusion : The experiments in both years indicate little difference in the quality of the cheese or loss in weight, whether curd in a well-lighted room or in a dark room. The growth of mould was about the same on both lots of cheese. The results indicate that light makes little difference in the ripening of cheese, so long as the temperature and moisture in the room are favorable.

Coating Cheese with Paraffine Wax.

A revival of interest in coating cheese with paraffine wax led us to experiment further with this method during the past season. In 1896 we reported as follows :

"Excelsior Cheese Coating (paraffine wax) does prevent shrinkage, but the scorings do not indicate any improvement in the quality of the cheese. It did not prevent mould."

In October, two vats of milk, containing about 1,540 pounds of milk each, testing 3.9 per cent. fat, were made into 10 cheese, weighing about 32 pounds each. Two of these were dipped in paraffine wax at a temperature of 180 degrees as soon as taken from the press. Two others were dipped in the wax at the end of one week. Two others were dipped at the end of two weeks; and two others at the end of three weeks. The remaining two were not coated. The loss in weight during one month in an ordinary curing room was nothing for the cheese coated directly from the press. The others lost an average of .78 per cent., 1.57 per cent. and 2.36 per cent. respectively, while the cheese uncoated, lost an average of 3.16 per cent. in weight during one month.

The quality of the cheese is indicated by the scoring, in which the uncoated cheese scored an average of 38 out of 40 in flavor and a total of 93.7 points out of 100. Those dipped when taken from the press scored 35 in flavor and a total of 87.5. Those dipped at the end of one week scored 36 in flavor and a total of 90.5. Cheese dipped in two and three weeks from the press scored 36.5 and 91, and 37.5 and 92.7 respectively for flavor and to-

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tal. In the foregoing scores all cheese were scored full (10 points) for finish. The scoring was done by Mr. G. H. Barr, Dairy Instructor, and we asked him to score the finish of the uncoated and coated cheese, which had been kept under the same conditions and without spraying with formalin. He scored the cheese coated at the end of one week, an average of 9.25, those coated directly from the press, 8.5, those paraffined in two and three weeks at 7.75 and 7.5, and those uncoated 6.5 points out of ten.

During August and September, four experiments were made with cheese weighing from 32 to 73 pounds, to determine the effects of paraffining cheese directly from the press and curing in cold-storage and in an ordinary curing-room. The milk used in each experiment varied from 1,254 lbs. to 1,450 lbs. The percentage of fat in the milk used varied from 3.6 to 3.9.

The paraffined cheese lost nothing by curing in cold-storage; while those coated and cured in an ordinary curing-room lost an average of but .39 per cent. Those not paraffined lost an average of 2.14 per cent. in cold-storage, and in the ordinary curing-room they lost 2.88 per cent.

The cheese which were paraffined directly from the press and placed in cold-storage at about 40 degrees scored an average of 37 out of 40 for flavor and a total of 92 out of a possible 100. Those not paraffined also scored 37 for flavor and a total of 91.3, the difference being in closeness and color in favor of the paraffined cheese. Taking appearance into account, Mr. Barr scored the paraffined cheese 7 out of 10 and the uncoated 4 out of 10.

The duplicates of the foregoing placed in an ordinary curing room, which were paraffined, secored an average of 35 for flavor and a total of 90.1. Those uncoated scored 34.1 for flavor and a total of 88.6. Taking appearance into account, he scored the paraffined cheese an average of 6.1 out of 10, and the uncoated 4.4 out of 10.

Conclusion: Dipping cheese in hot paraffine wax when about one week old prevents loss of moisture and adds somewhat to the appearance of the cheese, but does not prevent the growth of mould. The cheese ripened in an ordinary curing-room and coated with the wax was poorer in quality in one series and better in the other. In cold-storage the quality was slightly better as a result of paraffining. Whether or not it will pay to coat cheese with paraffine wax is a question not settled yet. If paraffining is done the best results are got by coating when cheese are about one week old.

The Dairy Herd.

Our herd at the present writing (Dec. 15th) consists of twelve pure-bred Holstein cows and heifers, three pure-bred Jerseys and three Ayrshires, sixteen grade cows and heifers, six pure-bred Holstein calves, two Jersey calves and five grade calves, making a total of 47 head of cattle. Most of these are young cows and heifers.

It will be noticed that the record of the herd is considerably lower than that of last year. This is probably due to things which we could not control. Three of our best cows had mammitis (or inflammation of the udder) early in the year and were of little use for the remainder of the season. Two of them were sold for beef. The last six cows on the list are two and three year old heifers. We were obliged to change milkers several times during the year, and have had three different men in charge of the herd, all of which has evidently affected the yield of milk and butter. However, we

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are hoping for better results next year, and expect to attain a standard of 10,000 lbs. of milk, or 400 lbs. butter per cow.

Record of Herd from Dec. 1, 1901, to Nov. 30, 1902.

Name of cow.	Date when last calf was dropped.	Breed.	Live weight.	No. days milking.	Total lbs. milk.	Per cent. fat in milk.			Total lbs. fat in milk.	Total lbs. butter estimated by adding 15 % to fat.
						Average for year.	Highest test monthly.	Lowest test monthly.		
Marcena	Jan. 20, 1902..	Holstein	1,056	326	10,795	3.76	5.00	3.00	401.57	461.57
Twenty	Dec. 13, 1901..	Grade	1,122	308	9,587	3.62	4.20	3 00	339.17	390.04
Molly	Jan. 6, 1902..	Grade Holstein	1,400	289	8,837	3.75	4.50	3.30	329.03	378.38
Daisy of Rockwood.	Jan. 18, 1902..	Holstein	1,088	266	8,822	3.39	4.20	2.80	294.77	338.98
Lady Springwood...	Feb 12, 1902..	"	1,180	334	7,694	3.32	4.10	3.00	258.88	297.71
Lucy	Mar. 22, 1902..	Grade Holstein	1,036	296	7,564	3.50	3.80	3 00	267.64	307.78
Topsy	April 3, 1901..	" Short'n	1,100	302	7,457	4.06	4.40	3.40	297.77	342.43
Dolly	Dec. 4, 1901..	" Holstein	1,617	269	7,262	3.50	4.10	3.10	252.19	290.01
Grey	Aug. 4, 1902..	" Shorth'n	1,055	244	7,172	3.96	4.60	3 50	278 83	320.65
Polly	June 18, 1902..	" Holstein	1,147	285	7,124	3.60	4.10	3.20	252 34	290.18
Mar. Cornelius	Sept. 17, 1902..	Holstein	1,409	278	7,112	3.34	3 60	3.20	238.05	273 75
Heidleburg	Feb. 15, 1902..	Grade Holstein	1,000	310	6,855	4.15	4.60	3.70	279.47	321 39
Meg	Sept. 14, 1902..	Holstein	1,167	229	5,921	3.98	4.50	3.20	228.59	268 37
Emerald Rose	July 28, 1902..	Jersey	940	344	5,356	4.57	5.00	4.20	245.64	282.48
Jean III	April 18, 1902..	Grade Ayrshire	910	298	5,053	4 37	5.00	3.50	213.89	245.97
Patience	Jan. 3, 1902..	Ayrshire	1,000	308	5,052	4.14	5 00	3 20	204.10	234.71
Lilly	Dec. 23, 1902..	Jersey	640	283	4,896	4.46	4.90	4.00	215.25	247.53
Bella II	July 18, 1902..	Grade Sherth'n	1,042	249	3,824	3.93	4.30	3.60	149.55	171.98
Glen Bessie	Feb. 5, 1902..	Ayrshire	932	244	3,593	4.07	4.80	3.60	143.08	164.54
Margaret White	Nov. 16, 1902..	Holstein	1,196	226	3,489	3.47	4.20	3.00	129.73	149.18
Average			1,102	284	6,673	3.84	..	..	250.87	289.28

1. The cow which stood at the head of the list last year is again first Her milk yield is somewhat less (584 lbs.) than last year, but her butter record is greater (24 1-2 lbs.). She is a pure-bred Holstein.

2. The second cow for milk and butter production is an ordinary grade cow of no particular breeding. She gave 9,587 lbs. milk and 390 lbs. butter.

3. The milk from each cow was weighed at each milking, and samples were taken for fat determinations with the Babcock tester. The composite samples were tested monthly, and 15 per cent. was added to the fat in estimating the butter yield.

4. The six heifers at the end of the list have lowered the average for the herd, and we shall expect them to do better next year.

Needs of the Dairy Department.

1. A refrigerating plant and small refrigerator in the dairy building for the benefit of students and for improving facilities in our experimental work during the summer time. Ice refrigeration is not suitable for creamery work in hot weather, as the temperature cannot be got low enough and the labor is too great.

2. The sewerage system from the dairy is in need of improvement. I beg leave to recommend that the plot of land west of the dairy buildings be underlaid with sufficient tile to dispose of the sewage by the sub-earth system.

3. The dairy stables need a system of ventilation very badly.

We are indebted, as usual, to the Farm Department for hay, silage, roots and bedding.

All of which is respectfully submitted.

H. H. Dean.

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PART X.

THE PROFESSOR OF AGRICULTURE AND FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College :

Sir,—I have the honor to submit herewith my tenth annual report.

The work in lectures covered by my associate, Prof. Cumming, and myself, is fully outlined in the College Circular, and will not be dealt with here. I may say, however, that we are aiming to make our work as practical as possible, and that the short course in stock judging inaugurated last winter, promises to open up a field of great usefulness. Below is given a report of the experimental work and farm superintendence.

Experiments with Fattening Steers.

Roots vs. Silage.

This experiment is a continuation of last year's work. The experiment was commenced with six steers on roots, hay, and meal, and eight steers on silage, hay and meal. One steer in the root group was sick during part of the experiment, so that he has been omitted from the calculation.

The steers consumed, approximately, two pounds of roots for each pound of hay, and two pounds of silage for each pound of hay, in the respective groups.

The roots comprised both turnips and mangels, and the silage was from corn of the Leaming variety.

The experiment lasted from November 22nd to March 21st, a period of 119 days.

Gain in Weight of Steers.	Silage group	Root group.
Average gain per steer in 119 days	210.5 lbs.	213 lbs.
Average gain per steer, per day	1.76 lbs.	1.78 lbs.

The food consumed per 100 lbs. gain, live weight, was as follows :

Root Group: Meal, 453 lbs.; hay, 657 lbs.; roots, 1,394 lbs.

Silage Group : Meal, 432 lbs.; hay, 648 lbs.; silage, 1,321 lbs.

In order to simplify the comparison, we will attach arbitrary money values to the foods consumed, say, meal, $18.00 per ton; hay, $8.00 per ton; roots, $2.00 per ton; and silage, $2.00 per ton. According to this valuation, we get the following:

Cost of 100 lbs. gain in root group, $8.09.

Cost of 100 lbs. gain in silage group, $7.80.

When the roots and silage are valued at the same price per ton, therefore, the silage group made slightly cheaper gains than the root group.

If we assume that the smaller amount of meal and hay required for 100 lbs. gain in the silage group was due to the use of silage, and that the valuation of the hay and meal is a reasonable one, then, according to this experiment, if a ton of roots is worth $2.00, a ton of silage would be worth $2.44. That is to say, in order to make the cost of 100 lbs. gain in the silage group, the same as that of the root group, the following valua-

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tion would have to be employed: Meal, $18.00; hay, $8.00; roots, $2.00; silage, $2.44, each per ton. If, however, the meal and hay be valued at a higher price per ton, the difference between the value of roots and silage would be still greater.

In this experiment, therefore, a ton of silage showed a higher feeding value than a ton of roots; and in this respect the result is similar to that of last year, though the difference in favor of silage was greater last year.

Short-keep vs. Long-keep Steers.

In purchasing steers for feeding, it is a perplexing question whether it is better to buy moderately heavy, fleshy steers, which can be made ready for export by February or March, or to buy lighter, thinner steers, which must be kept until May or June. The short-keep steer costs more per pound than the thinner steer; but against this we have quicker returns and less labor, in his favor. Every feeder understands these features of the case; but the relative amounts of food required to produce a pound of gain in the two classes of steers, has never been systematically studied. We propose to study this question purely from the standpoint of the amount of dry matter required for a pound of gain, leaving the question of markets and labor out of consideration for the present.

Of the 13 steers used for experimental purposes during the past year, 7 of the larger and fleshier steers were selected to represent short-keep animals, and were fed with the object of having them ready for market not later than March: and the remaining 6 were fed with the object of marketing in May or June.

The short-keep steers had to be fed a heavier meal ration than the long-keep steers, in order to get them ready for market in time. The average meal rations for the two groups were as follows:

Short-keep Steers: .94 lbs. (nearly 1 lb.) meal per day per 100 lbs. average live weight.

Long-keep Steers: .59 lbs. (nearly 3/5 lb.) meal per day per 100 lbs., average live weight.

The short-keep steers were fed from November 22nd to March 21st, or 119 days. The long-keep steers were fed from November 22nd to May 15th, or 174 days.

The gains, and dry matter required for one pound of gain, live weight, are given below:

	Short-keep 119 days.	Long-keep 174 days.
Average gain per steer	220 lbs.	289.16 lbs.
Average gain per steer, per day	1.83 lbs.	1.6 lbs.
Dry matter consumed per one pound increase in live weight	16.15 lbs.	13.52 lbs.

Notes.

1. The short-keep steers made larger daily gains than the long-keep steers.

2. It required 2.63 lbs. more dry matter for a pound of gain in the case of the short-keep steers, than in the case of the long-keep steers.

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3. In this experiment, the lonk-keep steers had a very marked advantage; but it is unsafe to draw conclusions from a single experiment, and it is intended to make further trials.

Three-year-old Steers vs. Two-year-old Steers.

This experiment is merely an incidental feature of our steer experiments for the year, in which it happened that three three-year-old steers were fed the same rations as four two-year-old steers, and the weights and food consumed are given below:

	Three year old steers.	Two year old steers.
Average gain per steer in 119 days	223.3 lbs.	217.5 lbs.
Average daily gain per steer	1.87 lbs.	1.82 lbs.
Dry matter consumed per one pound increase in live weight	16.95 lbs.	15.74 lbs.

Notes.

A peculiar feature of this comparison is that, while the three-year-old steers made slightly the larger gains, they required more food for a pound of gain than the two-year-old steers.

It is a pretty well established fact that young steers make more economical gains than older ones, and this experiment emphasizes the fact.

Fattening Lambs.

Roots vs. Silage.

Silage is highly recommended for sheep by some feeders, and is held in very low esteem by others. It was thought advisable, therefore, to conduct an experiment with roots and silage for lambs, as well as for steers. For this purpose, 20 lambs were divided into two groups of 10 lambs each. One group was fed roots, hay, and grain, and the other silage, hay, and grain, the hay and grain being the same for each group. Two pounds of roots were fed for each pound of hay, in one group, and two pounds of silage for each pound of hay, in the other group. The lambs were fed 1 1-2 lbs. of mixed grain each per day, in addition to the roots, silage, and hay. The experiment lasted 15 weeks. The gains, and dry matter consumed for each pound of gain, are given below:

	Root group.	Silage group.
Total gain 10 lambs in 15 weeks	318 lbs.	272 lbs.
Average gain per lamb, per week	2.12 lbs.	1.81 lbs.
Dry matter required for one pound increase in weight	11.1 lb.	12.94 lbs.

From the statement given above, it will be seen that in this experiment the lambs fed roots made decidedly larger gains, and required less dry matter for a pound of gain than those fed silage.

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Experiments with Swine.

We have had a most unfortunate experience with our experimental swine during the past year. In May we had an outbreak of contagious pneumonia, and before we got it stamped out we had to destroy all the hogs we had on experiment throughout the winter. It also interfered very seriously with our summer work, so that we lost all the work of the winter of 1901-1902, and were able to complete only one experiment during the summer. The experiment is given below.

Feeding on Pasture vs. Pen Feeding.

The main object of this experiment was to test the influence of rape upon the firmness of bacon, when the rape was fed in conjunction with a liberal meal ration. The hogs were about 3 months old when the experiment commenced, July 8th. The outside hogs were first turned upon a half-acre plot of vetches, and three weeks later were given half an acre of rape. They were confined with movable hurdles, and the plot enlarged as they ate off the rape. Altogther, they had slightly over an acre of rape. They were fed dry meal twice a day, which was composed of three parts barley to one part middlings, during the greater portion of the time. As they kept comparatively thin, they were taken into the pens and fed all the meal they would eat during the last three weeks of the feeding period.

The inside pigs were fed in pens, with small outside yards. They were given the same meal ration as the outside ones, and once a day they were fed a small amount of rape, about equal in weight to their meal ration.

There were 18 pigs in the outside lot, and 13 in the inside group.

On November 7th, 10 of the outside hogs and 8 of the inside group were delivered to the Wm. Davis Co., Toronto, where the sides were marked and carefully examined, after they came out of the salt, some three weeks later. Below is the report upon the sides:

Report of the Wm. Davies Co.

"The hogs which you recently delivered to our packing house are now out of salt, and we have pleasure in reporting to you as follows :-

"The bacon from the hogs in both groups was firmer than that in any previous shipment which we have received from you. The sides of bacon mentioned as 'slightly pasty' below, represented only the difference between a very firm side and one which had a slight tendency to softness, but was not in any case sufficient to throw the side in question into the "soft" class.

"Group (1), 10 hogs, 6 sides slightly pasty, 4 of which were from unfinished hogs.

"Group (2), 8 hogs, 2 slightly pasty sides from a rather unfinished hog.

"The writer does not remember at this time the outlines of your feeding test, but the above results show very conclusively that the hogs which you delivered to us produce an excellent quality of bacon."

Note: Group I. outside hogs; Group II. inside hogs.

From the report given above, it will be seen that the result of feeding rape, as described, was extremely satisfactory, so far as quality of bacon was concerned.

In dividing the hogs for experiment, the strongest and most growthy hogs were selected for outside feeding. The comparison as to the relative

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economy of the two methods of feeding is not fair, therefore, to the inside group. Both groups required more meal than usual for a pound of gain, owing, no doubt, to the fact that a number of the hogs were unfavorably affected by the disease which they contracted. The outside hogs required 5.45 lbs. of meal for a pound of grain, and the inside hogs 5.47, so that the two groups were practically even in this respect. If allowance is made, however, for the difference in the two groups at the time of commencing the experiment, the results are decidedly in favor of the inside feeding, for the outside hogs were a much superior lot to begin with.

To sum up: the inside feeding gave rather more economical gains in each of two years, making due allowance for initial differences in groups.

In each of two years, hogs pastured on rape, with a liberal allowance of meal, and hogs fed in pens, with a small allowance of rape, in addition to a full meal ration, gave bacon of excellent quality as to firmness.

There seems to be no doubt that a moderate allowance of succulent food, such as clover, rape, vetches, or roots, has a beneficial influence upon the firmness of bacon.

Farm Superintendence.

Crops.

Meadow. We harvested 90 acres of hay, which averaged a little over two tons per acre. Owing to very wet weather, a good deal of the hay was damaged.

Barley. 12 acres Mandscheuri variety. Sown April 17th, at the rate of 1 1-2 bus. per acre. Commenced cutting July 30th. A good crop, but not all threshed at time of writing.

Cultivation for Barley. Barley followed potatoes. Potato ground was cultivated and ribbed in the fall. In the spring the ribs were harrowed, then cultivated with spring tooth cultivator, harrowed, sown with drill, and finished with Breed weeder. Barley was seeded with grass and clover at the rate of 12 lbs. per acre. Seeds were mixed in proportion of 4 lbs. timothy, 8 lbs. red clover, and 2 lbs. alsike.

Oats. About 65 acres, 12 acres of which were the Liberty variety, and the remainder Siberian. All the oats lodged badly, owing to the wet season, the Liberty being especially bad in this respect. Seeding commenced April 21st, and harvesting August 7th. Oats were sown at the rate of 1 1-2 bus. per acre.

Cultivation for Oats. Oats followed roots, corn, and sod. The root ground was treated the same as the potato ground for barley. The corn ground was plowed lightly in the fall, with two-furrow plows, harrowed twice, and ribbed up for winter. Spring cultivation, same as for barley. The sod was plowed early in September, rolled, harrowed, and subsequently cultivated, so that the sod was fairly well rotted in the fall. Spring cultivation, same as for barley. Oats were seeded with grass and clover mixture, as described under barley.

Winter Wheat. About 20 acres were sown, 9 acres each of Dawson's Golden Chaff, and Early Geressee Giant, and one acre each of Diamond Grit and Michigan Amber. The crop was not sown until September 18th, on account of the prevalence of the Hessian fly the preceding year. The late seeding, however, proved disastrous, for the crop hardly grew enough to withstand the winter successfully. It winter-killed some, and rusted

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badly, so that no attempt was made to determine the yield of the different varieties. The average yield was about 20 bus. per acre. It was sown at the rate of 1 1-2 bus. per acre. Between 3 and 4 pounds of timothy per acre were sown with the wheat, and 8 lbs. of clover seed, before the frost was out of the ground in the spring.

Cultivation for Wheat. Winter wheat followed peas. The poorer parts of the field had been manured during the winter and spring before the peas were sown. Immediately after the peas were harvested, the ground was cultivated, harrowed, and rolled, and allowed to lie about two weeks, for the purpose of causing as many weed reeds to germinate as possible. The ground was then plowed lightly with two-furrow plows, harrowed thoroughly and sown with the drill.

Peas. The only peas sown this year were grass peas, of which we had 15 acres. They were sown April 17th, at the rate of 1 1-2 bus. per acre. Owing to the cool, damp season, they did not ripen properly, and were practically a failure.

Cultivation for Peas. Peas followed sod. The cultivation was the same as for oats on sod, except that the ground was manured during the winter and gang-plowed in the spring.

Mangels. 7 acres Yellow Intermediate. Sown May 8th and 10th, in drills 30 inches apart, at the rate of 4 lbs. of seed per acre. Thinned to 12 inches apart in rows. Yield per acre, a little over 800 bus.

Cultivation for Mangels. Mangels followed sod, which was plowed about 4 inches deep during the latter part of August and beginning of September. The ground was rolled and harrowed after plowing, and later, was thoroughly cultivated with the spring tooth cultivator. Manure was applied during the winter at the rate of 15 tons per acre. In the spring, the ground was gang-plowed, harrowed, rolled, gone over with the grubber both ways to thoroughly loosen the lower soil, harrowed again, rolled, and ribbed with a double-mouldboard plow for sowing.

Turnips. 5 acres Hartley's Bronze Top. Sown June 18th in drills 28 inches apart, at the rate of 2 lbs. seed per acre. They were thinned to about 10 inches apart in the rows. Yield per acre, 800 bus.

Cultivation for Turnips. Turnips followed sod, and cultivation was practically the same as for mangels.

Potatoes. 8 acres Empire State. Planting commenced May 16th. The blight seriously affected the yield, which was about 125 bus. per acre.

Cultivation for Potatoes. Potatoes followed sod, and fall cultivation was the same as for mangels, except that manure was applied in the fall, and the ground ribbed up with double-mouldboard plows. In the spring the ground was harrowed down, gang-plowed, grubbed, harrowed, and rolled. Then the double-mouldboard plow was used to open up furrows 28 inches apart, and the potatoes planted 12 inches apart in the furrows. The drills were then split with the plow, covering the potatoes immediately after planting. The potatoes were cut in medium-sized pieces, having, at least, two sound buds on each piece, and the pieces were dusted with land plaster after cutting.

Corn. 20 acres Wisconsin Earliest White Dent, and 10 acres Mammoth Cuban. Planted in hills, 38 inches apart, commencing May 23rd. The wet, cold season was very unfavorable for corn, and the yield was very little over 10 tons per acre.

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Cultivation for Corn. Corn followed sod, and the preparation of the soil was practically the same as for mangels and turnips.

Live Stock.

Cattle. Our stock of cattle in the Farm Department comprises the following:

Shorthorns. 1 two-year-old bull, 2 yearling bulls, 3 cows with calves at foot, 4 two-year-old heifers with calves at foot, 3 yearling heifers.

Herefords. 1 yearling bull, 1 cow with calf at foot, 2 two-year-old heifers in calf, 1 bull calf.

Aberdeen-Angus. 1 bull, 1 cow with calf at foot, 1 two-year-old heifer, 2 yearling heifers.

Galloways. 2 cows, 1 heifer calf.

Holsteins. 1 bull, 3 cows.

Ayrshires. 1 bull.

Jersey. 1 bull.

Steers. 21 feeding steers.

Sheep. Small flocks of Shropshires, Oxfords, and Leicesters are kept.

Swine. Our breeding operations are restricted to Yorkshires, Tamworths, and Berkshires, of which the Yorkshires are the most numerous, owing to the greater inquiry which we have for this breed.

GENERAL NOTES ON FEEDING AND MANAGEMENT.

As a rule, though sometimes circumstances compel us to depart from it, the bulky part of our ration for cows, steers and young cattle, consists of a mixture of pulped roots, silage and cut hay, mixed about a day in advance of feeding. We think there is less waste of hay with this method. For bulls, our bulky ration is usually turnips and cut hay. The meal ration varies with circumstances. Oats and bran constitute our favorite ration for bulls and growing stock, and from one to two pounds of oil cake per animal per day is usually fed in addition. The quantity of meal varies with what we regard as the requirements of the case. There is little danger, however, of hurting an animal with oats and bran. The steers are fed almost anything that is available in the way of meal. We like to use considerable corn in their meal ration, when we can get it worth the money. Peas, barley, wheat and some oats are also used. Steers which are to be kept until May or June get very little meal before the middle of December, and then only 4 or 5 lbs. per day. They are gradually increased after this, according to their condition, though we seldom exceed, on an average, half a pound of meal per day per hundred pounds live weight of the steers. Steers intended for market in February or March are fed more heavily, beginning with about one-half lb. meal per day per 100 lbs. live weight, and gradually increasing, though we seldom reach a pound of meal per day per 100 lbs. live weight of the steers.

In winter our sheep subsist mainly upon mixed clover and timothy hay and pulped turnips, a full grown sheep being allowed about 4 lbs. of roots per day. Lambs receive a ration of oats and bran in addition, and the ewes are also allowed a light grain ration for a month or six weeks before lambing.

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The swine receive a variety of foods. We get a large quantity of kitchen refuse from the college kitchen, and practically all the hogs are given a share of this. To a large extent, the kitchen refuse takes the place of roots. Our grain ration is principally barley and middlings, or barley, wheat and middlings. Sometimes a few oats are included in the mixture. For small pigs, we find a mixture of one part barley to three parts middlings to answer very well. The proportion of barley or other grain is usually increased as they grow older. Breeding sows are usually fed more oats in their ration, and the meal ration is limited, except when suckling pigs, at which time they are fed liberally. Roots and kitchen refuse are fed in considerable quantities. In winter, breeding animals are given exercise in a shed built for the purpose, and for the summer a pasture lot has been provided. For pasture, we are using vetches and rape. This green food is also cut and fed to pigs in the pens or paddocks during the summer.

Financial Matters.

In previous years an attempt has been made to show the various credits and debits of the Farm department, but it has always been a very unsatisfactory undertaking. The Farm department supplies other departments with various products, such as hay, silage, roots and pasture for the herd in the Dairy department; hay and roots for stock in the Experimental Feeding department; potatoes to the College boarding house; hay and grain for eight or nine horses belonging to other departments; besides assisting other departments in various ways with men and teams. These things might be estimated with a fair degree of accuracy (though it is very difficult always to draw the line between the farm and other departments, owing to their dependence upon one another); but the Farm department has to supply stock for educational purposes, and it is impossible to value this work in dollars and cents. Further, the appropriations for the Farm and Experimental Feeding departments are not kept separate, and I find it impossible to obtain a separate statement of the expenditure of each one. Since it is impossible, therefore, to give a statement which would be absolutely fair and accurate, and since no special purpose could be served by a separate financial statement of the Farm department outside of the general financial statement of the institution, I have taken the liberty of omitting this usual feature of my report. Trusting this will meet with your approval,

I have the honor to be,

Your obedient servant,

G. E. Day.

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PART XI.

THE PROFESSOR OF HORTICULTURE.

To the President of the Ontario Agricultural College :

Sir,—I have the honor of presenting herewith my tenth annual report on the work of the Horticultural department.

In looking back over the work of the year, we nearly always experience a feeling of regret that, in a field such as ours, which offers such limitless opportunities for good work, more has not been accomplished. Yet we have good reason for assurance that we have not labored in vain; for, although our efforts have necessarily been spread over too wide a field to make very marked advancement in any particular line of the work, still we know good steady progress has meen made in most, if not all. What we most urgently need is more men and more money, if we are to make the advancement we desire, and which is expected of us.

Instruction of Students.

As the regular courses of instruction in this department are fully outlined in the Circular, and as the scope and methods of teaching were fully outlined in last year's report, I shall refer briefly to only two branches of the work under this head.

Floriculture. Floriculture is a subject upon which in recent years there has been a keen and constantly growing demand for information, both by town and country people. The methods we have adopted of enabling our students to gain this information is, we think, the proper one, considering our conditions. When the College opens in the fall, the students begin observing and studying the specimens still in bloom in our large borders of annuals and perennials: and before they leave in the spring they are given a collection of seeds gathered from these borders during the summer, with which to start similar ones at their own homes. During the winter the students are required to become as familiar as possible with the different kinds of plants in the greenhouses; and the methods adopted to keep them in a thrifty, vigorous condition. After some practice in methods of propagation, they are allowed to propagate for themselves a collection of those kinds known to be the most satisfactory for home growing. This plan has stimulated a great interest in the work, and nearly every member of the class upon leaving the College last April took with him a choice collection of house plants of his own propagation.

Forestry. For want of a better arrangement, the subject of forestry has been attached to the department of Horticulture. We have been doing our best with it, but cannot begin to give it the time and attention which its importance demands. What is needed is a well-trained man, who can give his whole time to it; one who can give our students a good practical training, and who could not only begin the much-needed work of re-foresting a considerable portion of the College Farm, but could also encourage and assist in this work throughout the Province. The increasing interest in this subject of late years well warrants such an appointment, and we trust it will not be long in coming.

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CORRESPONDENCE.

One of the ever increasing duties of the heads of departments here is the attention to correspondence. Nearly every mail brings letters inquiring about the best varieties to plant; the best time and method of pruning; what fertilizers to use; and a hundred and one other such questions relating to all the varied branches of horticultural work. To answer all of these personally takes much time, and often careful research, yet we believe that in no other way could the various departments here render better service to the public. The appointment of a departmental stenographer and typewriter has very much relieved us of the clerical part of this work, and we are glad to give in this way all the information we can to those who desire it.

CONVENTIONS ATTENDED.

The following conventions were attended during the year, and addresses were given as mentioned:

The Provincial Fall Fairs' Association, Toronto, Feb. 19th and 20th, where I spoke on "The Fall Fair as a Horticultural Educator," and presented a model prize-list for the adoption of Fall Fair Boards.

The Canadian Horticultural Association, Hamilton, Sept. 3rd and 4th, where I spoke on "The Relation of the Professional Florists to the Local Horticultural Societies."

The International Plant Breeders' Convention, held at New York, Sept. 30th to Oct. 2nd.

The Ontario Fruitgrowers' Association, held at Walkerton, Dec. 1st to 3rd, where I gave an address on "The Growth and Development of Fruiting Branches in Our Common Fruits," and presented the Report of the New Fruits' Committee on the New and Seedling Fruits of the Year.

The Ontario Agricultural and Experimental Union, Guelph, Dec. 8th and 9th, where I presented a report on our Co-operative Experiments with Small Fruits, and a report as Treasurer of the Experimental Union.

BULLETINS, REPORTS AND ARTICLES PUBLISHED.

In connection with Prof. Reynolds, of the Department of Physics, a bulletin was published giving the results of some of our experiments with apples and pears in cold-storage.

In the Nature Study Bulletin, published by the Department of Agriculture, I prepared "The Story of the Apple."

For the Fruit Experiment Station Report, I prepared a report on my annual inspection of the stations.

For the Ontario Fruitgrowers' Report, I prepared a report on the seedling fruits of the year.

For the Experimental Union Report, I prepared a report on our Co operative Experiments with Small Fruits.

For the Report of the Secretary of the Fall Fairs' Association, I prepared model prize-lists for the adoption of Fall Fair Boards, on Fruits, Flowers and Vegetables.

Besides numerous questions answered in the Farmer's Advocate and Canadian Horticulturist, the following articles were contributed to the public press:

First Lessons in Fruitgrowing. No. 1, Tree Roots; No. 2, Tree Trunks; No. 3, The Growth of Trees; No. 4, The Tree Top and Branches; Observa-

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tions on Buds; Some Peculiarities of Fruit-spurs; Lessons on Leaves; Study of Fruit Blossoms; Fruit Prize-lists; The Fall Fair as a Horticultural Educator (Canadian Horticulturist); Address to the Canadian Horticultural Association; The Co-operative Testing of Small Fruits in Ontario (Montreal Star); Seedling Peaches in Guelph (Guelph Mercury).

Inspection of Fruit Experiment Stations.

During the summer I visited ten out of the fourteen of our Fruit Experiment Stations. These visits were made, as far as possible, at the most opportune time for seeing what was being accomplished. Note was taken of what progress is being made, and a number of photographs were taken at each station, to illustrate some of the most important features of the work.

I am glad to say that these stations are now doing excellent work, and the results obtained are of great value to the people of this Province. A full account of this work, and my report on the inspection of the stations, will be found in the Report of the Fruit Experiment Stations.

Co-Operative Experiments.

In connection with the Experimental Union, we have, during the past nine years, been carrying on a series of co-operative experiments with small fruits. At first these experiments were confined to about half a dozen counties and sixty experimenters. Now they have found their way into every county and district in the Province, and a few are being carried on in each of the other Provinces of the Dominion. We have now on our books the names of over 1,200 experimenters engaged in this work.

The following figures give some idea of the extent of the distribution of plants during the time we have been engaged in this work. During the past nine years we have sent to experimenters: 2,832 currant bushes, 3,596 gooseberry bushes, 4,368 blackberry bushes, 5,592 red and white raspberry plants, 5,688 black raspberry plants, and 31,872 strawberry plants—making a total of 53,948.

The valuable features of this work might be briefly summed up as follows:

1. Through the plants distributed, many get a start in the growing of small fruits, who probably never would have made a start otherwise.

2. The concise, cultural directions sent out with each lot of plants enable beginners to adopt the right methods of cultivation from the beginning.

3. The varieties distributed are those which have been found, by repeated tests at the College, to be most likely to prove satisfactory with the experimenter.

4. From the plants sent out, each experimenter may soon propagate for himself enough plants to set out a large plantation.

5. The experience and information gained in properly planting, cultivating, cropping, weighing, recording, and reporting the results, with one of these simple experiments, is an education in itself of value to anyone, young or old.

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Experimental Work at the College.

For several years past we have been conducting extensive variety tests with strawberries, raspberries, gooseberries, blackberries, currants, and tomatoes, and much valuable data have been accumulated, a brief summary of which is presented from year to year in this annual report.

Tests are also under way with the larger fruits, such as apples, pears, plums, peaches, cherries, quinces, and grapes.

Apples.

In the young orchard, set out six years ago, quite a number of the earlier bearing varieties are now coming into bearing; and we are finding that, as is often the case, many of the varieties are not true to name, and will have to be grafted over to the proper kinds. In a block of thirty Talman Sweet apples, that were planted for top-working, we have been adding a number of new varieties by top-budding. This plan of top-working has proved very successful, and many of the buds have made a growth of two and three feet the first season after the branches are headed back.

The following varieties fruited heavily his year on young trees six years planted: Ben Davis, Duchess, Gano, Gideon, Longfield, Ontario, Wagner, and Wealthy. All of the crab apples, viz., General Grant, Hyslop, Martha, Montreal, Transcendent, and Whitney, also bore heavily.

The following have begun bearing and bore a light crop this year: Alexander, Benoni, Baxter, Bottle Greening, Cooper's Market, Duchess of Oldenburg, Fallawater, Haas, Hubbardston, Hare Pipka, Hurlburt, Maiden's Blush, Magog Red-streak, Peter, Shackleford, Stark, Talman, Trenton, Utter's Red, Walbridge, and Wellington.

Pears.

Pears have, on the whole, not done so well as apples, and many of them appear to be having a struggle for existence in this climate. The Bartlett has been doing well as a dwarf. It began fruiting two years after planting, and all of the trees bore a nice crop this year.

The following varieties, grown as standards, began fruiting this year: Bartlett, Easter Beurre, Flemish Beauty, Giffard, Keiffer, Lincoln, Lawrence, Manning's Elizabeth, and Seckel.

Plums.

The plum trees have made a very fair growth; and of the American varieties, the following bore a fair crop this year: De Soto, Hawkeye, Weaver, and Wolfe.

Of the Japan varieties, the Abundance and Burbank have both been fruiting for two or three years. The latter are by far the most vigorous growing and most productive trees in the orchard.

Of the European varieties, the following have begun fruiting: Beauty of Naples, Field, Grand Duke, Lombard, Monarch, McLaughlin, Reine Claude, Smith's Orleans, Shropshire Damson, and Victoria.

Cherries.

There are about thirty varieties of cherries in our collection, and most of the sour varieties, such as Early Richmond and Montmorency, made a very satisfactory growth, and have been bearing for the past two years.

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Quite a few of the sweet varieties have made a fair growth, but a number of them are showing signs of being too tender for this section. A few have begun fruiting, but the crop has been light, and so scattered that the birds usually pick it all before we get a chance to secure any of it, or make a record of its quantity.

Peaches and Quinces.

We have included in our test of the tender fruits, ten varieties of peaches and three of quinces. For the first year or two, these trees were given winter protection by wrapping the trunks and tops with straw and corn-stalks, but last winter they had no protection, and although the ends of the quince branches were more or less killed back, yet all of the trees survived the winter. Of the peaches, Barnard's Early, Crane's Early, and Fitzgerald bore a fair crop this year.

In and about the city of Guelph a great many peach trees bore a large crop of fine fruit this year. We examined specimens of the fruit from about thirty seedling trees, one-third of which might be classed as first-class varieties. We have secured pits from nearly all of the trees producing the best fruit, and intend to grow seedling trees from them under our more exposed conditions. If we can in this way raise a variety of greater hardiness, without losing any of its good qualities, we will have obtained a much desired result.

Strawberries.

For the past seven years we have been conducting an extensive variety test with strawberries, and during that time have fruited nearly 300 varieties. Careful notes have been taken upon the habits of the plants, and the character of the fruit of each variety, and every picking has been carefully weighed and recorded. In this way, much valuable data have been obtained, but only a brief summary of the results can be presented in this report. We have been frequently asked, "Well, after all your testing, which is the best strawberry?" This is a question too indefinite to be answered satisfactorily. If we were asked, which is the most productive berry; the largest berry; the best table, or canning, berry; the earliest, or the latest berry—the answer would be much easier; for there are many desirable characters in a strawberry, and so few varieties that possess more than one or two of these, that such a question cannot be answered without knowing what characteristics are most desired.

In the following paragraphs we will mention a dozen of the most desirable varieties that have been under test. This list includes one or two of the newer ones, which have been fruited for the first time this year, and a number of the older ones that have made a record for themselves, after several years of trial. The planter may select from these a half dozen of those most likely to suit his purpose, and no grower should be content with less than half a dozen varieties of strawberries. Among the leading early varieties are: Van Deman, Wesley, Sadie, and Splendid.

Van Deman has been fruiting here now for seven years, and although somewhat lacking in vigor of plant, and while not so productive as any of the others mentioned, yet it is one of our choicest very early varieties, being of fair size, firm, and a beautiful dark rich color.

Wesley has been fruited for five years. It is a very vigorous, pistillate sort. The fruit is rather small, but ripens early, and is produced in great quantity.

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Sadie also has been fruited here for five years. It is a vigorous grower, and a good pollenizer for early pistillate varieties. This variety has not only proved early, but very productive. The fruit, however, is not nearly so large as that of Van Deman; but it is plump, firm, and of good quality.

Splendid is one of the old varieties that has been fruited here for seven years. It is a vigorous grower, with perfect blossom. The fruit is of fair size, firm, and of a good color. On the whole, it is not so early as Van Deman, but it is much more productive.

Among the leading midseason varieties are: Clyde, Warfield, Williams, Tennessee Prolific, and Parson's Beauty.

Clyde has been fruited here for five years, and has proved to be one of the best yielders in the lot. This year it ranks fourth on the list, but for the average of five years it easily ranks first. The plant is vigorous and healthy, and is a good pollenizer. The fruit is very large, smooth, and regular in form; only moderately firm, but of too pale a color to make a first-class berry.

Warfield is one of the old standard varieties. It is a wonderful plant-maker, and on moist soils, or in favorable seasons, is one of the most productive; but it will not stand drought or dry soils. The fruit is uniformly of medium size, firm, of a very dark rich color; and being so easily hulled, it is one of the favorite varieties for canning. The past season, being a showery one, our crop of Warfields was unusually fine.

Williams and Tennessee Prolific have been fruited here now for seven years. Both are vigorous growers and have made good records for productiveness. The Williams is probably one of the best known berries throughout the country, and is deservedly popular because of its adaptability to varied soils and conditions. The berries of both varieties are large and firm, and in most respects are very much alike, except that the fruit of the Tennessee has not the green tip, which is one of the worst faults of the Williams.

Parson's Beauty is a new variety which fruited here for the first time this year, and headed the list in yield. It is very unusual that a variety makes such a record the first year of its introduction. The plant is vigorous and healthy, and the blossoms perfect. The fruit is large, not quite so smooth as might be desired, but firm, and of good color. This is certainly a very promising market variety, and we shall watch with interest its behavior in the future.

Among the most desirable late varieties are: Irene, Saunders, and Buster.

Irene has been under test for five years, and has made an excellent record for productiveness. The plant is vigorous and healthy, and the blossoms are pistillate. The fruit is of medium size, and retains its size well to the end of the season. It is firm, and of that dark rich color so much desired for canning.

Saunders is, in many respects, like the Williams, and has made a good record here during the past seven years that it has been fruited.

Buster has been under test for five years, and has made an exceptional record for productiveness. The plants are very large and are vigorous and healthy; and the blossoms are pistillate. The fruit also is very large, but light in color, and not firm enough for distant shipment.

With a view to ascertain the rate at which strawberry plants naturally increase by runners, seventeen of the standard varieties were selected, and six plants of each were planted at the usual time in the spring, 3 feet

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apart in the regular rows, which were 4 feet wide. They received the same treatment as plants grown in the regular way, and all of the runners were allowed to set. In the following spring the number of plants set of each variety was counted, and the figures below give the average increase of runners per plant:

Jocunda, 23; Anna Kennedy, 30; Irene, 31; Haverland, 31; Van Deman, 32; Fountain, 32; Glen Mary, 37; Clyde, 38; Wm. Belt, 41; Warfield, 42; Buster, 47; Burt, 48; No Name, 51; Standard, 53; Wesley, 56; Ruby, 85; Sadie, 100.

This gives an average increase for all varieties of 45 plants per plant set, and it shows how quickly one may get a large stock of these plants from a small beginning.

Raspberries.

In our experimental raspberry plots there are now over 60 varieties. They are set in rows six feet apart each way, and our records are based upon the results of six hills, of six canes each, of each variety. As with the strawberries and all other small fruits, each picking is carefully weighed and recorded. In summarizing the results, it may be said that the results this year tend largely to confirm those reported in previous years.

Columbian again heads the list for productiveness, and his year it gave nearly double the yield of Shaffer, which it much resembles. Both of these varieties belong to the purple-cane family, and propagate by rooting of the tips of the canes. The fruit is of a dull red or purple color, excellent for home use, but not attractive enough for a market berry.

Loudon, Cuthbert, and Marlboro' still rank among the best of the bright red fruited varieties. All of these propagate rapidly from suckers, and they rank in the order named for total yields this year. Marlboro' is a week or ten days earlier than Cuthbert, while Loudon is somewhat intermediate between the two. All produce large, firm, handsome berries, which make a good appearance in the market.

Black Raspberries.

Twenty-five varieties of black raspberries are now under test in our experimental plots, about half of which have been fruiting for the past six years. This fruit seems to be one of the most variable in its yields from year to year, and often the variety producing the largest yield gives the smallest berries. In mentioning a few of the best, we have to take into consideration, therefore, the size and quality of the berries, as well as the productiveness of the bush. The following may be mentioned as a few which, on the whole, have proved most satisfactory.

Eureka has been fruited now for six years, and has on the whole proved quite productive. The fruit is of a good size, fairly firm, ripens early, and gives a long season of fruiting.

Palmer has had its ups and downs, but on the average of six crops has made a good record. The fruit is of fair size and moderately firm.

Older has proved to be one of the hardiest varieties, and on the whole is one of the most productive. The fruit is large, glossy black, without bloom, not quite firm enough for a market berry, but one of the best for home use.

Gault has been under test for five years, and has made a very good record for productiveness. The fruit is of good size and fairly firm.

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Hilborn is one of the old standard varieties, which is hardy and productive. The fruit is of medium size and only moderately firm.

Smith's Giant is a new variety, a seedling of the Gregg, raised by A. M. Smith, St. Catharines. It did not yield so well this year as in the two previous years, but the fruit is very large and quite firm. This variety is one of the latest to ripen its fruit, and will be valuable to lengthen the blackcap season.

Currants.

In our new currant plantation we have altogether forty-six varieties, and in all about seven hundred bushes. These were set out a year ago last fall; and although many of them began fruiting this year, we have thought it advisable not to report upon the comparative yields till next year, when all should be in bearing, and we could make better comparisons.

Most of the bushes have made excellent growth, and this plantation promises some interesting results.

In the older plantation are fifteen varieties, which have not been under close observation for six years. The two most productive varieties by far in this plantation have been Raby Castle and Prince Albert; but on both of them the berries are so much smaller than those on Fay's Prolific, Cherry, and Victoria, that they are not so desirable, either for home use or market.

All things considered, Fay's Prolific must still be conceded first place, both as a home and market currant. It is a good yielder, and the fruit is very large and handsome. Its worst fault is a sprawling habit of growth of bush, which necessitates careful pruning to keep it in shape.

Of the white currants, the White Grape is by far the most productive; in fact, this has always been the most productive currant in the whole collection, yielding about half as much again as the most productive red, and two or three times as much as the heaviest yielding black variety.

Among the black currants, the Black Naples has now been at the head of the list four times during the six years they have been under test; although the Champion makes a very close second.

In our new plantation there were twenty varieties which fruited, most of them for the first time this year. It is too early yet to make comparisons; but the most promising one so far is the Black Victoria. The young bushes of this variety bore a good crop of very large, handsome currants, of particularly good quality.

Gooseberries.

In the new plantation of gooseberries there are now about forty-five varieties under test, thirty-four of which fruited this year. A careful record was made of the yields, but it has been thought best not to publish these till another year, when all varieties should be in bearing.

In the older plantation, twelve varieties, six of them American and six English, have been under test for six years in succession, and the results have been very uniform from year to year. The following is the yield per bush for the average of six years' crops:

English Varieties.	Ounces.	American Varieties.	Ounces.
Autocrat	10.10	Pearl	62.42
Whitesmith	5.50	Downing	61.39
Crown Bob	5.47	Houghton	50.87
Industry	5.24	Champion	35.40
Triumph	2.40	Red Jacket	30.32
Dominion	2.27	Smith's Improved	14.60

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Taking an average of the results given above, we may observe that, on the whole, the American varieties have been a little more than eight times as productive as the English varieties.

Until this year, the English varieties have always been more or less seriously affected with mildew, a disease from which the American varieties have always been exempt. This year there was little or no mildew on any of the varieties, and the crop was much better than usual. The cause of this, no doubt, was the unusually cool, moist season, which afforded conditions more like those of Great Britain, where these varieties do so well.

Pearl and Downing, which stand at the head of the list, are so nearly alike that it is hard to distinguish between the two. The berries are large, light green in color, and of good quality.

Red Jacket, although fifth on the list for productiveness, ranks next to the two just mentioned in value. It produces large, handsome berries, about one-half larger than those of Pearl and Downing, and for this reason is worth a little more in the market.

Tomatoes.

The past season, while particularly favorable for gooseberries, was unusually unfavorable for the ripening of tomatoes. The tomato requires a long season of warm weather to mature its full crop. During the cold, wet weather of last season, only the earliest ripening kinds matured fruit of any account, and even these did not give half of an average crop.

Forty-nine varieties of tomatoes have been included in our tomato experiments, which have been going on now for five years.

Atlantic Prize and Earliest of All, two of the earliest varieties, have for an average of four years been most productive, but this year and last they were surpassed by Dominion Day, a newer variety, introduced by Bruce of Hamilton. These varieties all began fruiting at the same time, and as far as appearances go, they are all very much alike.

Mayflower and Plentiful are two excellent later varieties which did well in former years, but last year they ripened only a very light crop.

IMPROVEMENTS ON THE CAMPUS.

With the addition of three large buildings on the campus this year, this department has had a lot of extra work in grading and levelling the grounds about them, and in the laying out of drives and walks to give easy access to them. We had not sufficient help to complete this work, as it should have been done this fall, and a lot of labor will be required next spring to put these parts of the grounds in good condition for sodding and seeding. The planting of trees and shrubs, which necessarily accompanies such improvements, will be proceeded with as soon as the ground can be got into condition for them. The trees and shrubs for this purpose have already been secured, and have been planted in the nursery rows, so that they will be on hand and in good condition for planting whenever the grounds are ready for them.

Respectfully submitted,

H. L. HUTT.

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PART XII.

THE PROFESSOR OF BACTERIOLOGY.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith my report of the past year's work in the department of Bacteriology.

LECTURES.

The usual courses of lectures to the students were given during the year. These comprise: (1) A course of 30 lectures on bacteriology in its relations with agriculture and dairying for second-year students. (2) A more advanced course on the same subject to fourth-year sudents. (3) To our fourth-year specialists in biology and horticulture, a special course of lectures on the bacterial diseases of plants, and those diseases produced by enzymes (e.g., mosaic disease, or Frenching of tobacco, Peach Yellows, etc.). (4) To the fourth year specialists in dairying, a rather extensive course of lectures and laboratory work on dairy bacteriology.

The special dairy class which is here for three months, monopolizes much of my time in the winter semester, because on account of our limited accommodation and the number of students, the work has to be repeated six times to get once over the class.

Last year I published a small text book, "Elementary Exercises in Dairy Bacteriology," which now forms the substance of the laboratory work in Dairy Bacteriology for the Dairy School students. These exercises are made as practical as possible, and treat of the following topics: The nature of milk; the effect of food, temperature, gaseous environment, physical agents, and chemicals on bacterial life; the bacterial contamination of milk; the fermentations of milk; pasteurization and sterilization; bacteria in butter-making; bacteria in cheese-making, etc. In view of the widespread complaints as to the keeping quality of milk, I have endeavored in these exercises to emphasize the danger of bacterial infection, and the reasons for cleanliness in all operations connected with the dairy business.

MEETINGS ATTENDED.

During the year I attended a number of conventions and delivered addresses before the

1. Ontario Bee Keepers' Association. Adress: The use of Formalin for Controlling the Foul Brood of Bees.

2. The Western Dairymen's Association. Addresses: Bitter Milk and Cheese. Pasteurisation for Butter Makers.

3. The Ontario Normal School of Domestic Science. Addresses: The Preservation of Food Products; Milk as an Agency in the Conveyance of Disease.

4. The Dominion Master Bakers' Association. Address: The Abnormal Fermentations of Bread.

5. The Medical Health Officers' Association. Address: The Identity of Human and Avian Diphtheria.

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Publications.

During the year the Ontario Department of Agriculture have issued several bulletins, prepared by myself, alone or in conjunction with other members of the College Staff. The titles of these are as follows :

Bull 117. Pasturization of Milk for Butter-Making, pp. 16 (wih Prof. Dean).

Bull. 118. Yeast and Its Household Use,—pp. 16.

Bull. 120. Bitter Milk and Cheese,—pp. 32.

Bull. 121. Ripening of Cheese in Cold Storage,—pp. 12. (With Profs. Dean and Harcourt.)

Besides the above, I contributed the "Story of the Yeast Plant" to the Nature Study Bulletin, recently published.

The Department has also in the press a bulletin by Dr. Streit and myself on "Roup, an Infectious Disease of Fowls."

Other publications during the year, appearing in various periodicals, are as follows :

La Duree de la Vie du bacille de la tuberculose, dans le fromage,—La Revue Generale du Lait, 1902.

Lait et Fromage Amers,—La Revue Generale du Lait, 1902.

Note on a new organism producing rot in cauliflower and allied plants, —Science, 1902.

My assistant, Dr. H. Streit, has also published: Die Vogeldiphtherie,—Zietschrift fur Hygiene und Infektions Krankheiten.

Routine Laboratory Work and Analysis.

During the year (11 months), we have manufactured and sent out 200 doses of tuberculin and 102 pure cultures, or starters, for cheese and butter making.

We have also made bacteriological analyses of the following substances, and have reported the results to those sending the material :

Water	3
Diseased hens and turkeys	23
Diseased organs, pus, etc.	26
Anthrax	8
Milk, off-flavored or suspected of causing disease	10
Urine	4
Off-flavored cheese	20
Off-flavored butter	2
Plants (bacterial disease)	5
Diseased swine	10
Total	101

As we are desirous of studying diseases of the udder (mammitis) we shall be glad to receive samples of milk from diseased udders, or portions of this organ, if the cows are slaughtered. In such cases, the results of our examination will be reported privately to those sending the material. We should also like farmers and veterinarians to make more use of the assistance we offered in the Report of 1901; and we again mention a few points on the subject of what to send and how to send it.

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Assistance Offered to Veterinarians and Farmers.

In cases of disease,—send the organ or material carefully wrapped in an antiseptic wrapper, giving full particulars regarding it. It is best to send by express; and in summer it may be necessary to pack in ice.

In cases supposed to be, or suspected of being :

Anthrax,—send an ear, or some of the blood, spleen, or liver of the dead animal.

Symptomatic Anthrax, Black-leg, or Quarter Evil,—send the parts infected, as this disease is usually in the muscles.

Malignant Oedema (similar to black leg, but showing more fluid in the subcutaneous tissues, which, unlike the fluid found in cases of black leg, is almost colorless),—send the part affected.

Tetanus or Lockjaw,—on account of the difficulty of finding the bacillus of this disease, it is almost useless to send material, unless the point of inoculation is known, in which case, cut away and send the flesh around the point of inoculation.

Glanders (a disease which affects either the nasal passages or the skin, in the latter case called Farcy),—send some of the ulcers from the parts infected, or of the discharge from the nasal passages.

Hog Cholera and Swine Plague,—send any diseased portions of the animal.

Actinomycosis, or Lumpy Jaw,—send in a bottle a little of the matter found in the tumor mass.

Rabies, or Hydrophobia,—send the base of the brain or medulla oblongata of the animal suspected.

Tuberculosis and Pseudo-Tuberculosis,—send any tubercles or diseased glands.

Mammitis, or Inflammation of the Udder,—Send a sample of the milk in a clean bottle that has been boiled in water.

In cases of diseases affecting poultry, such as Chicken Cholera, Roup, Tuberculosis, or Blackhead,—send the whole bird.

Urgent Needs.

We need more room for practical work in bacteriology. The laboratory course for the dairy students has to be repeated six times in order to get round the class once; and when these students are in the laboratory, there is no room for our regular students or specialists. Our facilities for keeping animals—a small room in the basement—are not sufficient for our needs, and we are constantly receiving complaints from other people in the building about the smell from this room. We have obsolutely no accommodation for larger animals; and our experiments on swine diseases which are causing such loss in the Province, are at a standstill, because we have no isolation stable for experimental work. Such a stable is necessary for bacteriological investigation, and it would be very convenient for the Farm department to have a place to put diseased and suspected animals.

The establishment of the Macdonald Institute for Domestic Science and Manual Training will necessitate our giving a course of lectures and laboratory work on the preservation of foods, the bacteriology of milk, the use of yeast, the abnormal fermentations of bread and other food stuffs, etc., but with our present accommodation nothing in that line can be done. I would, therefore, urge that steps be taken to prepare for the eventualities mentioned, and others which are constantly arising in the department.

Research Work.

A considerable amount of research has been undertaken during

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the year. In some cases, the work has been finished; in others, it is still in progress.

I may refer to this in a few short paragraphs.

A Bacterial Disease of Cauliflowers and Allied Vegetable. There has been considerable loss to market gardeners and farmers in this vicinity, and in other parts of the Province, from a rot of cauliflowers and white turnips. A large number of diseased plants were examined by us, and a bacillus isolated, with which we were able to produce the disease by inoculation into healthy turnips and cauliflowers.

A number of experiments were made with the organism, to find out how plants become infected, the susceptibility of different varieties, and the best methods of repression.

The following methods will serve to check the disease :

1. Use of a rotation, by which other crops are grown on infected soil for a number of years.

2. Control of insect pests, as these serve to spread the disease.

3. Early harvesting of the crop.

4. Storage in cellars with a temperature below that of the minimum temperature of growth of the germ (50 degrees F.)

5. The planting of resistent and immune varieties.

So far as I am aware, this is the second bacterial disease of plants met with in Canada.

A full report of these investigations will shortly be issued in bulletin form.

Roup. After four years' work, we have concluded our studies upon roup. We have succeeded in isolating several micro-organisms, with which we can produce Roup in healthy fowl. We have also definitely ascertained that Roup, or, as it is more scientifically termed, Fowl Diphtheria, is not identical with human diphtheria, but is a different disease, produced by a different bacillus or bacilli, and differing also in the lesions which it produces:

Besides working out the etiology (or inquiry into the physical causes) of Roup, we have indicated several remedies by which the disease may be controlled, if taken in time. The Department of Agriculture has issued our bulletin on the subject—a comparatively brief and popular discussion of the subject, with illustrations of the disease, methods of treatment, etc.

Abnormal Flavors in Cheese. Through the kindness of Mr. Woodward, of the Dominion Department of Agriculture, who is the official referee on export cheese at the port of Montreal, we have been able to secure a number of characteristic samples of off-flavored cheese, sent from different parts of Canada to Montreal, for exportation to the British market. It is Mr. Woodward's duty to state if the cheese is "finest" or not; and he very kindly sent us a number of samples of condemned cheese, that we might examine them, and, if possible, find out the cause, or causes, of the trouble, and suggest methods of prevention.

Samples of "off-flavored," "rancid," "stinking," and "fruity flavored" cheese, have been received; and from them we have isolated some interesting organisms, with which we have reproduced the flavors noticed in the samples they were taken from.

Our attention has been especially concentrated on the "fruity flavor." Seven or eight experimental cheese have been made during the season, with cultures of the different micro-organisms found in Mr. Woodward's samples, and we now have a collection of several yeasts, with which we have produced a characteristic fruity flavor.

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According to Mr. Ruddick, of the Dominion Dairy Department, the term "fruity" is applied to a peculiar sweet flavor, of very pronounced character, which is frequently found in cheese. It has a strong resemblance to the odor of fermented fruit, certain kinds of wine, etc. It is found in cheese from different sections of the country, and during the different periods of the season, but does not appear to bear any relation to the other qualities of cheese, whether good or bad. Usually its appearance is intermittent, and only certain days' make, or particular batches, are affected.

The cause, as I have already intimated, is a yeast, or, perhaps, several species or varieties of yeast; and the well-known fact that yeasts are constantly found on the surface of fruits and leaves of trees, leads us to expect that these "fruity" yeasts come from this source. I have already experimentally demonstrated that the yeast which causes "bitter" milk and cheese has its habitat on the leaves of maples; and other writers have found other species on fruits and foliage.

Hence remedial measures should be directed to better care of the milk, and better place to keep the milk in. Uncovered cans should never be kept under trees, and the practice of returning the whey to the farm in the same set of cans as the milk was brought in, should be discontinued.

1. The Stables. The bacteria existing in the air of most of the stables are very undesirable, especially those whose habitat is in the manure, dried particles of which are wafted about in the building by the slightest currents of air, and fall into the milk pails during milking, and during straining when the cans are kept in the stable or close to the barnyard.

Stables should be kept clean (as free as possible from cobwebs and accumulations of dust), and be whitewashed twice a year, once in the fall and again in the spring, when the cows are put out to pasture. The whitewash should be made from fresh lime; and, after slaking, a wash of about the consistency of cream should be made, strained through a piece of sacking, and applied by means of a brush or ordinary spray-pump. In the latter case, two or more applications are necessary each time. A little molasses, size, or Portland cement, added to the whitewash increases its adhesiveness. In case disinfection is thought to be necessary, crude carbolic acid may be used in the proportion of a pint to every gallon of whitewash.

Whitewashing not only decreases the bacteriological infection; but it increases the amount of light in the stables, thus directly promoting the health of the stock.

2. The Care of Cans, Pails, Strainers, etc. Nothing is more difficult to clean properly than cans, pails, strainers, etc., with the facilities at hand on the average farm. No mater how hard the good housewife may scrub the can, she will rarely succeed in cleansing it so thoroughly that it will be free from bacterial life. A solution of soda is commonly used, and it is effective in removing grease and other forms of dirt; but it has very little germicidal value. Even a four per cent. solution is of little use as a germicide. The final scalding with hot water (one cannot say boiling water) is insufficient to kill the bacteria on the inner surface of the can, and in the cracks and crevices which are usually present. Steam, the best means of sterilizing cans, is not available on the farm. Hence the proper place for cleaning cans is at the factory, where all appliances are at hand for doing the work thoroughly and expeditiously. Let all cans be thoroughly washed and sterilized before they leave the factory; and then let the factory insist, and see to it, that those in charge of the work on the farms supplying milk, (1) wash and scrub thoroughly (and occasionally scour) all pails, strainers, dippers, and

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other utensils used in handling the milk; (2) rinse all pails, strainers, dippers, etc., thoroughly with boiling water immediately before using; and (3) rinse the cans out thoroughly with boiling water a few minutes before putting the milk into them.

The practice of carrying ordinary, unpasteurized whey in milk cans from the factory to the farm cannot be too strongly condemned. So long as it is done, so long will there be trouble and serious loss from undesirable taints and flavors in milk; and the surprising thing is that good factories tolerate the practice. Let the whey be taken back in a can kept for the purpose; or, if that cannot be done, let all the whey be pasteurized at the factory by using the exhaust steam from the engine.

Utensils should be cleaned at the farm in the following manner: First, wash with water; then scrub well with a hot soda solution, using about two per cent. of soda (powdered concentrated ammonia may be used in stead of soda; next empty out the soda washings, and scald with boiling water; lastly, empty the water out and allow the can to drain dry. Provide, if possible, some kind of cheap rack, to set the cans on, at an angle of about 15 degrees. On such a rack, the cans will dry out nicely, and will not be much exposed to infection from dust, falling leaves, etc.

Do not, on any account, leave the water in the can; and do not use cloths or brushes in the final rinsing with the boiling water.

Milking. The cows, before being turned out in the spring, should have their flanks, udders, and tails well clipped. If before milking, the udder of the cow is rubbed with a damp cloth, the germs which are present on the hairy coat of the animal are prevented from falling off into the milk pail, as bacteria cannot leave a moist surface. Milking should always be done with clean, dry hands. Immediately after milking, the milk should be strained through a brass wire sieve, with several thicknesses of cheese-cloth on it, or, better, a woollen cloth; but these cloths must be carefully cared for and rinsed in boiling water every day. If they are not so cared for, their use should be dispensed with, as neglected cloths are an undoubted source of infection.

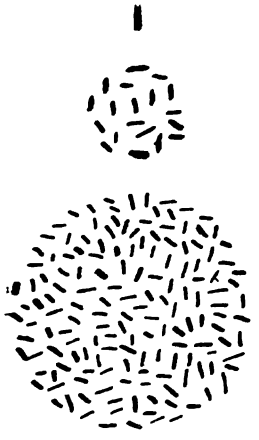


Fig. 1—Showing the effect of cooling milk on the growth of bacteria. The beneficial results of early chilling are manifest. (After Russell).

3. Aeration and Cooling. Aeration and cooling are both very desirable. I have already spoken of the effect of temperature on the growth of the bitter Torula; and the following figures show the rate of growth of a single germ:

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A reference to Fig. 1 will show the beneficial effect of early cooling, and I am strongly of the opinion that, if the milk is cooled sufficiently, the trouble from the fruity Torula will be largely overcome.

The Copenhagen Milk Company require that the milk be cooled to 40 deg. F. at the farm, and that when delivered at the city establishment, it shall not be more than 50 degrees F. These figures are possibly too low for

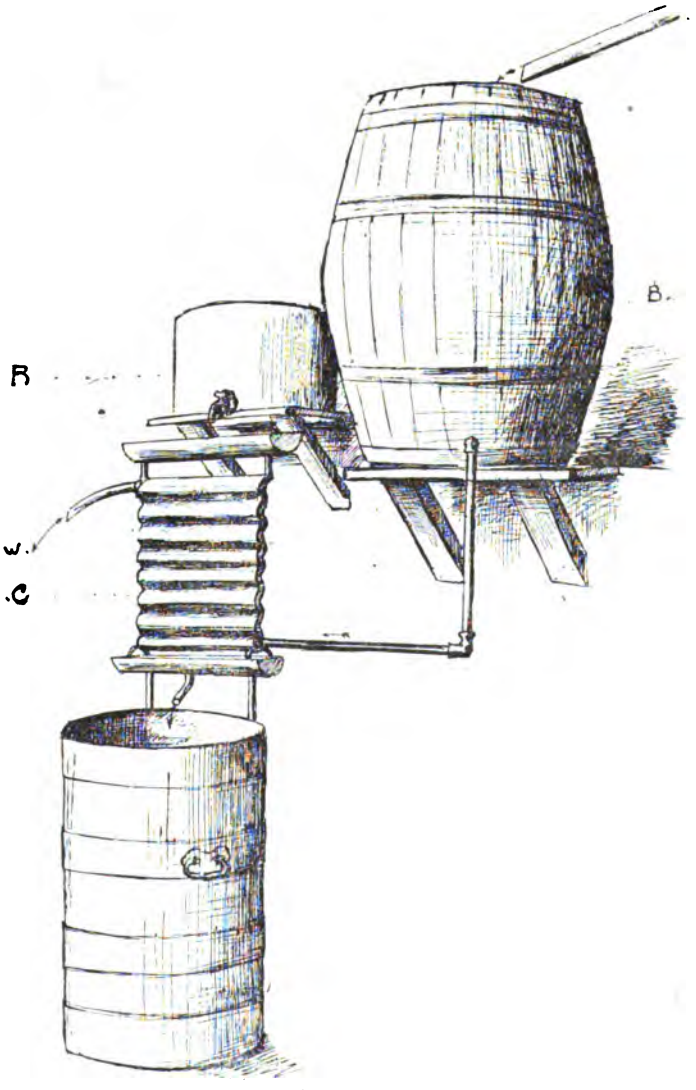


Fig. 2. Cooling and Aerating Apparatus.

B. Barrel filled with cold water from well.
R. Reservoir to hold contents of milk pails.
C. Cooler and aerator. The milk passes over the corrugations.
W. Waste water pipe from the cooler. The water enters below on the right side and passes out at W.

ordinary factory practice, but if the milk were cooled even to 60 deg. F. at the farm, or to a temperature, say, of two degrees above that of the water supply, it would be a great benefit.

Most of the best coolers aerate as well as cool, and those properly constructed should cool the milk to a temperature of two degrees above

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that of the water used for cooling. Should the farmers be unwilling to incur the expense of buying coolers, an arrangement might be made, as at Copenhagen, Denmark, by which the factory would let coolers out on hire. These coolers, made of copper tinned over, are practically indestructible. With ordinary care, they will last for ten or more years, and when the tin wears off they can be replated.

Most farmers now have windmills for pumping water, and a connection could be made with a barrel or tank suitably placed; and, if necessary, ice could be used in the barrel.

4. Place for Milking. Throughout this bulletin, I have emphasized the fact that most patrons keep their milk cans, both before and after filling, in very unsuitable places, where there is constant danger of infection from harmful bacteria or from the absorption of objectionable odors.

The factory management should clearly and strongly forbid the following practices:

(1) The keeping of uncovered cans under trees.

(2) The keeping of uncovered cans near stables, piggeries, or barnyards.

(3) The keeping of cans for more than short periods on milkstands by the roadside.

Every farmer engaged in milk production should have a room in which to cool and aerate the milk immediately after milking, and to keep the filled cans until the time of putting them on the stand for the drawer to collect. This room need not be large or expensive, and it should be convenient to the stable or place of milking; but in no case should it be placed where there is a liability of infection from barnyard dust, or where the milk is in danger of absorbing stable, barnyard, or piggery odors. It should be sheltered from the prevailing wind. A lean to against a building often serves the purpose very well.

In this room, there should be space for the milk cooler and accessory apparatus, a spring weigh scale, and a requisite number of milk cans, a strainer, pails, etc.; and the milk, taken there immediately after milking, should be strained, and at once emptied into the tank above the cooler. In this way, the cooling and aeration would be finished a few minutes after the last pail of milk was drawn. Fig. 2 conveys some idea of what the interior of such a room should be like.

Slimy Milk. We are at present examining, studying, and comparing the bacteria which produce slimy or ropy milk. Some of these have been isolated from slimy milk, and others from stable air. During our investigation of "bitter" milk, we frequently encountered these organisms, and hence our study of this interesting group. The results will be published later.

ACKNOWLEDGEMENTS.

I desire to acknowledge the courtesy of the Horticultural department in allowing us the use of a portion of the greenhouses during our study of cauliflower rot; and of the Agricultural department for providing us with a few swine for experimental work on an infectious disease of hogs, very prevalent in this district.

I also desire to record my appreciation of the services of my assistant, Dr. Streit, who has labored unremittingly, early and late, on the work entrusted to him.

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ANTHRAX.

During the summer of 1902, we had a large number of inquiries about anthrax, and we received a number of organs and samples of blood from animals suspected of having died with that disease. From the nature of the inquiries made, it is evident that many know little or nothing about this disease, which has resulted in serious losses on many farms.

The past season was a very favorable one for anthrax, for in wet years, when the ground water is high for a time and is followed by heat, many anthrax cases usually occur. The anthrax germ develops best on low, moist, swampy soils, which, after temporary inundation, dry out during hot weather. Hence we find that river flats are often infected; and some of them give rise to the disease every year. In one case which came under our notice, a farmer rented a low lying field in which cattle had died in former years. He was aware of this fact, but the knowledge did not deter him from pasturing a number of cattle in it. During a spell of hot weather an animal died; the carcass was only partially burnt, owing to lack of wood; some swine belonging to a neighbor, having got into the field, ate portions of the slightly charred or roasted flesh; and several of them died. Two kittens which had licked a few drops of blood oozing from the nostrils of the dead animal, died two days after. The farmer subsequently lost a few more of his cattle, and then changed his pasture.

This is a very good example of the risks that some men run from a lack of knowledge of this disease.

Another case which came under my observation a few years ago, involving the loss of stock and of a human life, occurred in the vicinity of a tannery. A workman handling some imported hides which had evidently come from an anthrax-infected district, contracted the disease and died. The drainage from the tannery ran into a small creek; and a number of cases of anthrax occurred on farms on both sides of the creek. To complete the chain of evidence as to the cause of the trouble, we isolated the anthrax germ from both the tannery effluent and creek. Other cases such as these might be cited, as tannery refuse dumped into streams has given rise to much anthrax on farms in the States of Delaware and Wisconsin.

The anthrax bacillus produces spores outside of the body; and on account of the formation of these very resistent forms, the germ is able to live or remain dormant in the soil for long periods of time. It has been known to live in soil for ten years.

The shallow burial of anthrax-infected animals, which have been cut open, in pasture fields or others places where animals graze, is always attended with a certain amount of risk, as the spores of the disease may be brought to the surface by earthworms, or by a rise in the ground water; and these spores again reproduce the disease if ingested by cattle or other animals. Even hay sold off such land may carry the disease. We once traced a case in this vicinity to hay which had been cut from an infected field.

The course of the disease is so sudden that farmers often think that their cattle have been poisoned. Hence in all cases of sudden death, an ear or a little blood from the animal should be sent to a bacteriological laboratory for examination.

The carcasses of animals that die from anthrax should be either deeply buried and well covered with quicklime, or completely burnt. If the animal has been opened and blood spilt on the surrounding ground, all portions of the ground touched by the blood must be thrown into the bottom of the hole dug for the carcass, or be well covered with wood and burnt.

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SHORT NOTES ON A NEW CHICKEN DISEASE.

In the month of June, 1902, we received from Preston, Ont., a few chickens, sick with an unknown disease. The disease seemed to be infectious, and had caused great loss among the fowls of the farmer who brought us the affected birds.

Although our investigations are not quite satisfactory in all points, we have found certain peculiarities, which are set forth below:

Clinical Symptoms. The clinical symptoms are those of a progressive anaemia (deficiency of blood of red corpuscles). The diseased fowl separates from the others, loses its appetite and vigor, and soon becomes thinner and thinner. It is somnolent, and when awakened it takes a few staggering steps and soon lies down again. Water is freely taken till death comes. The visible mucous membrane and comb becomes gradually very pale. Towards death, which may occur after a fortnight, one, two, or even more months, a profuse diarrhoea sets in, which takes away the last strength of the fowl. The diarrhoeal discharge is very offensive—yellow-grey, and often greenish in color—and ends as a rule with paralysis of the muscles of the cloaca. The body temperature is never feverish. The temperature ran between 40.5 and 41.5 degrees C., a temperature which is usually found in healthy fowls.

The pathological-anatomic symptoms, which were studied in five birds, were always similar. The bodies were very thin. In one chicken all bones were soft (from rickets), and could be easily cut with a pair of scissors. The blood in the heart was coagulated. The spleen was always a little or much enlarged. In one case, it was full of the small nodules found in all the livers (see later). The liver was the most diseased organ. It was much enlarged and had a yellow color, similar to cases of fatty degeneration. The liver capsule was in one case covered with a grey layer of pus; in all other cases it was smooth, clear, or slightly cloudy. Under the capsule and throughout the whole liver parenchyma were numerous grey nodules, often prominent above the surface. The nodules were 1-3 mm. in diameter, and could easily be removed. They were round; often five or more had grown together into a mulberry-like body. Under the knife, these bodies were fairly hard. The open cut was structureless, grey, and the surrounding liver tissue showed no inflammation.

In one case, in which the fowl had suffered from severe diarrhoea, the intestinal walls, especially those of the ileum and rectum, showed many circumscribed haemorrhages into the mucous membrane and sub-mucous tissue. The intestines contained a yellow-red, offensive chyme.

Microscopical Examinations. The blood of both living and dead fowls was always peculiarly altered. I examined it many times, and at different hours in the day, and always found the same results, even after treatment with quinine had begun. The red blood cells were of varying shapes and sizes, about 5-15 u long and 4-8 u wide. Round forms were numerous, which are very seldom found in normal blood. The haemoglobin in the blood cells was often unequally distributed, some portions being much darker than others. The white bood cells were present in large numbers, about 10 to 20 and 30 red ones. Many of them were very large, 15-20 u in diameter, and contained in addition to the nuclei, many (counted once more than 40) shiny, slightly bent rods, 1-2 u long and 1-4 to 1-2 u wide, which looked like bacilli (see e and d, Fig. 1). These rods were strictly confined to the white blood cells, and were never found free in the blood. They could not be colored with any anilin stains (boiling carbol-fucshin, etc.) and slowly disappeared after addition of concentrated sulphuric acid.

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Besides these two cell forms, there were small (2-4 u) round, elliptical bodies, about as numerous as white blood cells (see e in Fig. 1). They had the appearance of nuclei of red blood cells, could be stained easily, and showed a granular and reticulated structure.

The nodules in the liver and spleen, when crushed between two cover-glasses and examined in water, Lugol's solution, etc., consisted of small, elliptical or round cells, similar to those shown in Fig. 1 e.; some larger round cells, and debris of liver cells. The blood from the liver contained red and white blood cells and numerous protozoa. The protozoa were 7-12 u long, 2-5 u wide, and when examined in physiological salt solution, or in the blood alone, exhibited a continuous change of shape, but soon became motionless in Lugol's solution, potassium hydrate, or 2 per cent. acetic acid.

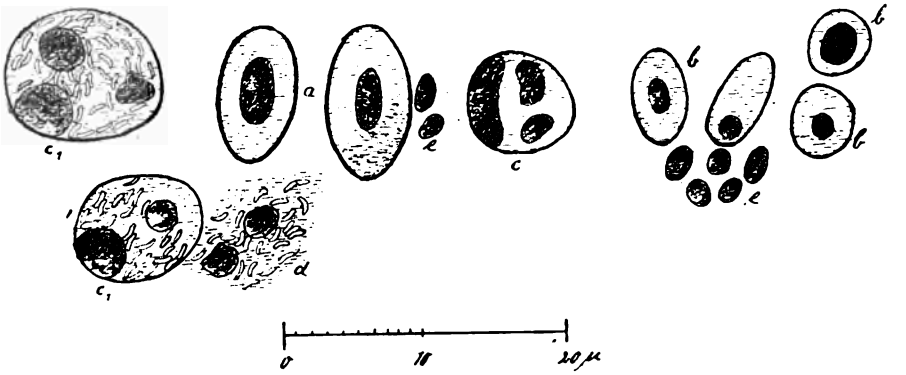


Fig. 1. Blood, stained with Methylene blue.

a. normal red blood cells.
b. small red blood cells.
c. white blood cell.
c1. enlarged white blood cells, containing bacilli-like foreign bodies.
d. crushed white blood cell, the enclosed bodies becoming free.
e. small nucleus-like round cells.

The movements of the protozoa were often amoeba-like, that is, the protozoa, approaching foreign bodies, sent out processes of their protoplasm, and retracted them after having past their bodies. The outlines of the protozoa were clear; many had a double membrane in places; others, a scale-like structure at one end (see Fig. 2). The whole body of the protozoon was slightly green and homogenous. Some forms showed a shade-like nuclear mass, slightly granular in structure when colored with methylene blue (1-4 hour), or with Romanowski or Ehrlich stains (see Fig. 1). Others showed, besides this central mass, a well-stained elliptical nucleus, like the bodies found in the blood shown in Fig. 1, e.

The motile bodies were more numerous in the fresh liver. When this organ was placed in sterile Petri-dishes at room temperature, they gradually decreased in numbers, and after 5-7 days had entirely disappeared. Instead, smaller round forms were observed, many of which were surrounded by a double membrane (see Fig. 2). These small, round bodies, though not so numerous as the motile forms, were still found after 5 and 6 weeks, when the whole liver had putrified. The same kind of protozoa were numerous in the haemorrhagic exudation in the mucous membrane of one chicken (see above), but could be observed in this location only for a few days.

In secretions from the liver and intestines, it was rather difficult to differentiate between red blood cells and protozoa, as both were much alike. The nodules in the liver were composed of smaller round cells, much like e in Fig. 1.

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Many attempts to obtain cultures from blood, liver, spleen, etc., resulted in failure, as only a few B. coli-colonies occasionally appeared. Microscopic examination failed to demonstrate the presence of bacteria.

To determine whether the disease could be directly transferred, we made the following experiments:

Diseased fowls were kept with healthy ones for several weeks, without positive results.

Healthy fowls were fed with liver, spleen, blood, and intestines of diseased ones. The only result was that two chickens suffered on one occasion from diarrhoea for two days. Later, blood from diseased fowls was transferred to the vascular system of healthy hens, without positive results.

Therefore, there must exist other conditions which allow of the spread of this disease, as it is not transferable directly, and not infectious.

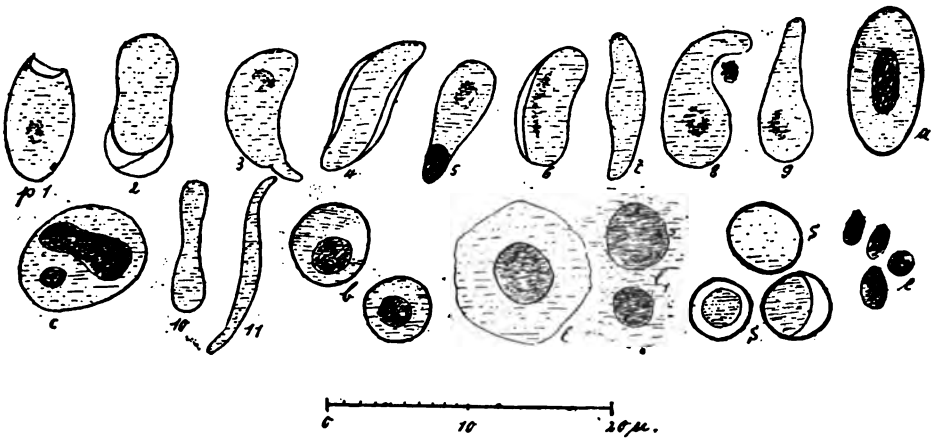


Fig. 2. Different bodies from fresh liver, stained with Methylene blue.

a. normal red blood cell.
b. small round red blood cells.
c. white blood cell.
e. small nucleus-like round cells, very numerous in the nodules.
l. liver cell.
ll. 2 nuclei of destroyed liver cells.
p1-p11 Protoza in different shapes.
s spore-like bodies, after 4 days.

As quinine proved to be a specific for many protozoan diseases (malaria, etc.), we tried to cure some of the diseased fowls by giving them quinine in doses of from 2 to 6 grains twice a day. Neither the appearance of the blood nor the disease itself was modified thereby.

In conclusion, we may mention that T. Smith has described a protozoan entero-hepatitis in turkeys, which we have also observed here in Ontario; but this disease is different from ours, as in the cases we observed,

1. The enteritis was often not present at all, and when present, it never reached the severe stage of intestinal ulceration and diphtheria.

2. The macro and miscroscopical appearances of liver and spleen were different from those of Smith's disease.

3. The protozoa were very motile and changed into a more resistent spore-like form, when kept in unfavorable conditions.

H. STREIT.

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THE IDENTITY OF HUMAN AND AVIAN DIPHTHERIA.

Diphtheria of the lower animals, especially of fowls and pigeons, has been the subject of numerous investigations; and when we examine the literature, we are immediately struck by the differences of opinion regarding the disease. On the one side, we have those who believe that the diphtheria of man and of birds are identical, and on the other side, those who believe that the one disease has no relation to the other.

If the two diseases are identical—that is, if both are caused by the same organism, the Klebs-Loeffler bacillus—we should have to demand the most rigorous treatment of diseased birds, and the disease would occupy a place of importance as high as that now accorded to bovine tuberculosis. But does our experience of the occurrence of fowl diphtheria and diphtheria in the human being lead us to the conclusion that there is a probability of there being any connection between the two diseases? Is not diphtheria a disease which is more prevalent in towns and closely-populated districts, where very few fowls are kept? Is not roup at certain seasons almost universally prevalent in some poultry yards in the country, where there may be hundreds of cases of the disease without a single case of diphtheria among those who look after the birds and treat them from day to day? Has it ever been observed that poultry-men are more frequently attacked with diphtheria than those who keep aloof from poultry yards? These and other questions suggest themselves to any one who critically examines the problem.

Let us, however, examine the work of various writers and investigators on the subject, which we may conveniently group under two heads:

1. Those who have investigated the disease as it occurs in fowls and pigeons, by the usual methods employed in working out infectious diseases.

2. Those who have made observations without experimental research, and who have not employed bacteriological methods to support or controvert their views, either for or against the identity of the disease as it appears in birds and man.

1. Experimental research:

Rivolta (1), Silvestrini (2), Friedberger (3) and Davaine (4), made a number of microscopical observations on the disease prior to the introduction of the bacteriological methods of Koch and Pasteur, and hence I shall not dwell upon their results, but pass on to the work of Loeffler (5), in 1884, on the diphtheria of pigeons and chickens.

From diphtheritic pseudo-membranes in the mouths of pigeons which died from an infectious form of diphtheria that prevails in Germany, Loeffler isolated a bacillus which when inoculated in pure culture into pigeons produced exactly the same symptoms as those which are met with in birds that acquire the disease naturally. This organism was quite different from the true diphtheria germ, and was not pathogenic for guinea pigs, rats, or dogs. Loeffler's discovery was subsequently confirmed by Cornil and Megnin (6).

Chicoli (7) and subsequently Krajeweski (8) found cocci in the false membranes of fowls, and Perroncito (9) saw coccidia in those of pigeons, chickens, and turkeys. In 1889, Pfeiffer (10) from fowls and pigeons attacked by diphtheria and contagious epithelioma observed corpuscles having amœboid movements which he considered were gregarines, and in other cases discovered flagellata which were difficult to distinguish from leucocytes.

The following year Babes and Puscariu (11) found Trichomonas showing the same characters as those described by Pfeiffer; but in diseased pigeons

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these protozoa were associated with the bacillus discovered by Loeffler, and which alone was able to produce the disease. Thus the Trichomonas must be looked on as being normally present in the pharynx of pigeons. In 1894, Loir and Ducloux (12) studied in Tunis an epizootic of diphtheria which affected fowls, ducks, sparrows, pigeons, and turkeys. From all these cases they isolated a motile bacillus with rounded ends, which gave yellow colonies on gelatine and did not stain by Gram's method. As cases of diphtheritic angina were frequent among those who cared for the fowls, Loir and Ducloux made bacteriological examinations of such persons, and isolated in one case the same bacillus as was found in the diseased birds.

The inoculation of this bacillus into healthy fowls gave them the disease. The same year Piana and Galli-Valerio (13), whilst studying an epidemic of pigeon diphtheria, found large motile corpuscles, 4 μ in diameter, which these authors considered as protozoa.

In America, Veranus Moore (14) has isolated a bacillus from the false membranes of fowls, which resembled the organism causing swine plague. Moore inoculated a culture of this germ into a young hen, which died, but without showing false membranes. Aged fowls were quite refractory to inoculation.

Mazzanti (15), Piana (16), and others have confirmed the observations of Pfeiffer with regard to the presence of flagellata, either alone or accompanied by micro-organisms.

In 1898, as the result of experiments on diseased fowls with diphtheritic antitoxin, Stevenson (17), of London, Ont., recommended the use of this serum for the treatment of diseased birds, and stated that "roup," the popular name for fowl diphtheria, was "Caused by a specific germ which appears to me to be identical with the Klebs-Loeffler bacillus, and that roup and canker were the same disease, a disease identical with diphtheria in man."

In 1899, McFadyean and Hewlett (18) found bacteria resembling the Klebs-Loeffler bacillus in the throats of pigeons suffering from canker; but they demonstrated that the disease could not be produced in healthy birds by inoculation of pure cultures of this germ, and they showed that it had no toxic effect upon mice and guinea pigs, such as that produced by inoculation with *Bacillus diphtheriæ*. Therefore they concluded that it was not the same organism.

I (19) have also obtained a germ resembling the Klebs-Loeffler bacillus from the throats of pigeons which were perfectly healthy before examination and remained so afterwards.

The above are a few of the numerous works relating to the etiology of fowl diphtheria. Let us now examine the opinions of some of those writers who favor the identity of human and avian diphtheria.

Buniva supported the first hypothesis of the identity of the two diseases. In 1879, Nicati (20) reported that cases of human diphtheria, especially of the conjunctiva, increased after epizootics of avian diphtheria. Menzies (21) announced that at Posillipo cases of diphtheria were noticed among children who drank water which flowed over a terrace occupied by pigeons and fowls. Gerhardt (22) published the report of an outbreak of diphtheria amongst two-thirds of the employees of a poultry establishment at Nesselhausen, where thousands of fowls had succumbed to diphtheria. One of the employees pecked by a diphtheritic rooster in the hand and foot subsequently showed false membranes in these locations. No cases of diphtheria were present in the environs of Nesselhausen at the time. Roth

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(23) reported that fowls which had swallowed the false membranes of diphtheritic children were affected by this disease.

Wheeler (24) observed diphtheria in a family which had eaten doves affected with diphtheria. Turner (25) stated that infant croup had been preceded by fowl diphtheria.

According to Paulinis (26), the Greek Isle of Skiatos, in which diphtheria had never previously been known, was infected after the introduction of diphtheritic turkeys. Boing (27), Hingworth (28), and Bilhaut (29), cited cases of the direct transmission of chicken diphtheria to man. In 1884, Chicoli (7) produced diphtheria in fowls by the inoculation of false membranes from man, and observed at the same time diphtheria among children who frequented places used by fowls affected by the disease. Emmerich (30), also established in his experiments that pigeon diphtheria could be transmitted to man, and *vice versa*. Bermont (31) observed at Bonvilers an epidemic of diphtheria among children affected with scarlatina, who lived in places occupied by diphtheritic chickens. Longuet (32) saw the disease in a soldier who attended chickens which were infected. Tissier and Longuet (33), thought that in 40 per cent. of the cases infected manure was the cause of the spread of the disease. This idea was supported by Chauveau (34), who considered the two diseases identical. Barbier (35) frequently saw diphtheria among fowls which lived beside insulated buildings for diphtheria patients, and stated the case of a woman, 67 years of age, who was attacked by diphtheria after having disinfected a poultry building infected with the disease.

Debrie (36) reported an interesting case. Some soldiers affected with diphtheria were admitted to the hospital at Sebdou. Immediately, the fowls, which were looked after by a hospital attendant, presented symptoms of diphtheria, and the owner and a soldier who cared for them were also infected. Cole (37) and Schwevens (38) also reported cases of the transmission of chicken diphtheria to children.

Such are the incidents given and statements made by those who believe in the identity of the two diseases; and against them there are almost as many made by the dualists, or those who believe the two diseases entirely distinct.

Thus, a pupil of Trasbot's (39), swallowed the false membrane of several hens without contracting diphtheria. Megnin (40) never observed diphtheria among those who took care of diphtheritic birds. Rivolta (41), discussing the observations of Gerhardt, said that the false membranes of fowls were not diphtheritic, but croupous, and that if the epidemic observed among the employees at Nesselhausen had been true diphtheria, it would not have remained localized, but would have spread to the environs. It was possible that the infection was transmitted from the fowls to man, but it was not diphtheria, but a light attack of croup.

Sante Sirena (42), studying the same epidemic reported upon by Chicoli, declared that he never saw a case of the transmission of the disease from birds to man, and that never had the cases of human diphtheria in Palermo been so rare as at the time of this epidemic!

Loeffler (5), the discoverer of the human diphtheria germ, was never able to produce diphtheria in fowls by the inoculation of the true bacillus; and Colin (43) obtained the same results. Nocard (44) denied the identity of the two diseases; and St. Yves Menard (45) considered the false membranes of fowls quite different from those of man, and had never seen cases of the transmission of the disease in the "Jardined acclimatation of Paris." Strauss

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had never observed cases of diphtheria among those who took care of diphtheritic pigeons. Gratia and Lienaux (46) and one favorable result from the administration of diphtheria anti-toxin to a diphtheritic chicken; but in all other cases the results were negative. These authors concluded that the inefficacy of this remedy for poultry was an argument against the identity of the avian and human forms of diphtheria.

It is impossible to bring into agreement all the data furnished by the above experimenters, unless we admit that the diphtheria of the birds in either produced by several different species of bacteria and perhaps coccidia, or that under the name of diphtheria there has been, as Galli-Valerio (47) remarks, "a lamentable confusion of different affections." We know that infectious pseudo-membranous inflammation of mucous membranes may be caused by the *Streptococcus pyogenes*, *Staphylococcus pyogenes*, and other bacteria; and many of the disorders caused by these organisms resemble very closely the local and general phenomena of diphtheria caused by the Klebs-Loeffler bacillus, and if such is the case in the human subject, it is more than probable it is also true of birds.

Seeing, therefore, that the research upon the etiology (physical cause or causes) of the diphtheritic affections of birds was so incomplete and so controversial, we have given this subject considerable attention, the work extending over a period of the last four years, and involving observations and inoculations of some 300 fowls.

The publicity given to Stevenson's paper in the Agricultural press led us first to examine the effect of human diphtheria anti-toxin on birds suffering from diphtheria and having well characterised pseudo-membranes. The anti-toxin was injected subcutaneously, and after the operation the birds were observed every day for a week, and then at longer intervals. Many were kept under observation for several months.

A series of thirty birds was inoculated with fresh serum, obtained from well recognized sources (Parke, Davis, and Mulford). The dose varied from 250-550 units, given either at one time or at intervals. Of the thirty birds so treated, but two showed signs of improvement, following immediately after the injection; but, three days after they were again badly diseased. The remaining 28 either showed no improvement, or even became worse after the treatment. In ten cases the disease persisted for three months, when the birds were killed and examined.

A series of eight birds was also treated with fresh horse serum, in doses from 2 to 5 c.c. Two hens treated with the larger dose died twenty-four hours after injection, a proof of the toxic nature of some horse sera, a fact which Cobbett has already pointed out. Two other birds showed some signs of improvement after treatment with smaller doses; and our Poultry Manager, reported to me after trying the fresh horse serum on a number of diseased birds, that in some cases he had seen partial cures, but it was not specific, and did not seem of much use.

The results of these experiments, therefore, show that:

1. Diphtheria anti-toxin inoculated into birds suffering from fowl diphtheria, and presenting pseudo-membranes, produced no practical or permanent results.

2. Were the germs of human and avian diphtheria the same, this anti-toxin certainly must have influenced the fowl diphtheria, since it is the best remedy known for human diphtheria.

3. Ordinary horse serum showed better results than anti-diphtheritic serum, but it could not be regarded as a specific.

The third series of experiments was made on five healthy fowls, which

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were injected with human diphtheria bacilli, which were obtained from two different cases and isolated on Loeffler's serum.

Fowl 1. Inoculated by scratching throat and rubbing in a twenty-four hour old culture of the Klebs-Loeffler bacillus. No membrane formed. Bird remained healthy.

Fowl 2. Same procedure, but bacillus from another source. No membrane formed. Bird remained healthy.

Fowl 3. Inoculated subcutaneously with the half of a serum culture of the K.-L. bacillus. No results.

Fowl 4. Same procedure, but bacillus from another source. No ill effects.

Fowl 5. Inoculated in sub-mucosa, with about half a c.c. of a K.-L. culture. No membrane formed. Bird remained healthy.

Two guinea pigs inoculated with the same culture died within thirty-six hours with typical symptoms of diphtheria.

The results of these experiments, therefore, show that the Klebs Loeffler bacillus is not pathogenic for hens.

We may also mention, in this connection, that we have repeatedly tried to infect rabbits and guinea pigs by injecting false membranes taken from diseased hens, but never with any success. We have also kept rabbits and guinea pigs confined in cages with disease hens; but these animals have never taken the disease. Stevenson stated that in his experiments when rabbits were fed from the same vessel as a roupy bird, they became infected with the disease and died as the result. But experiments conducted here have entirely failed to corroborate this statement. Not only did rabbits live for weeks in coops with roupy birds without becoming affected, but a doe brought up a litter in a coop in which were kept the worst procurable cases of fowl diphtheria; and these rabbits, though drinking from a vessel used by diseased birds, which was uncleaned for weeks, and eating hay and roots which were in constant contact with the birds, never showed any symptoms of ill health. If the disease in the fowls had been caused by the Klebs-Loeffler bacillus, it would certainly have been pathogenic for both the rabbits and guinea pigs, as we know these animals are used for standardising the diphtheria anti-toxin.

We have made cultures from over two hundred fowls, which died from diphtheria or were killed in certain stages of the disease, but we have not met with the Klebs-Loeffler bacillus in any of them, and consequently we cannot believe in the identity of the human and avian diseases.

We also find that the structure of the diphtheritic membrane of men and fowls is different. In the former, it consists of necrosed epithelial cells, and inflammation of the connective tissue beneath, with an abundant fibrinous exudation. If the membrane is formed in the trachea instead of the pharynx, the epithelial cells are shed, and the membrane consists almost entirely of fibrin, with leucocytes, the former arranged in laminae, but varying in density. The diphtheria bacilli are most frequently found lying in clumps in the spaces between the fibrin, and are usually most numerous in the superficial part of the membrane. The bacteria stain very well by Gram's method.

The membrane in fowls, however, consists almost entirely of pus cells, some granular masses, debris of epithelial cells (especially the swollen nuclei of these), and bacteria; and the micro-organisms which stain by Gram's method are seldom found in it.

This year we have succeeded in isolating certain bacteria from diseased birds, and producing the typical disease in healthy birds by the injection of these bacteria.

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Our final results and successes were obtained by using pigeons in order to increase the virulence of the casual organisms. Chronic diseases, of which we have an excellent example in fowl diphtheria, are notoriously hard to reproduce by the inoculation of healthy animals, because in most cases of sickness there must be not only the casual organism, but a lowering of the vital forces; and, to get over the difficulty, we used pigeons, which are easily infected, to increase the virulence of the casual organisms, and thereby assist in the infection of hens. In this way we produced roup in hens at pleasure by inoculation with the roup bacillus taken from roupy pigeons.

The roup bacillus tends to penetrate the deeper layers of the mucous membranes or submucous tissues. Hence, cultures made from swabs taken from false membranes very rarely contain the roup bacillus, because the bacilli are retained in the depths of the tissue.

The roup bacillus (which we have named *Bacillus cacosmus*) is especially difficult to isolate in cases in which the bird has had the disease for a length of time, as the tumors and false membranes contain very many other kinds of bacteria in large numbers. In our experiments, even when roup was produced in healthy fowls by the inoculation of pure cultures of the "roup bacillus," the mucous discharge from the very beginning contained many different kinds of bacteria.

The roup germs seem capable of remaining in a sort of dormant condition in the depths of the tissues for a very long time.—so long that the fowls sometimes appear convalescent; but suddenly, when the constitution is weakened by cold or other causes, the roup germs become active, and the diphtheria symptoms re-appear.

We have found that roup with all its varying symptoms, can be produced also by the inoculation of healthy hens with the well known *Bacillus pyocyaneus*, or green pus germ, which we have frequently isolated from roupy birds. Hence, it would seem that roup is simply a complex suppurative process, but different from ordinary forms of suppuration, the pus in fowls appears in the form of a half or entirely solid, cheese-like, yellowish white mass, without any tendency to become soft or liquid, or to perforate the surrounding skin.

This may be proved by the injection of sterile turpentine oil into the eyelids, which gives rise to inflammation, and the formation of a solid, cheese-like matter in the depths of the tumour.

Therefore, the cheesy masses must be regarded as pus.

The evidence adduced in the preceding paragraphs of this paper, the isolation of the casual organisms (the Roup Bacillus and the *Bacillus pyocyaneus*), and the production of typical fowl diphtheria by the inoculation of cultures of both of these bacteria into healthy birds, have, we think, shown the unsoundness of the theory of those who believe in the identity of human and avian diphtheria.

We are unable to state the possible danger of the Roup Bacillus to man; but we know that the *Bacillus pyocyaneus* produces abscesses, and occasionally gives rise to an epidemic of blood poisoning, as Williams and Cameron (48), have shown; but neither of these bacteria has the same pathogenic power as human diphtheria.

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*NOTE. I desire to acknowledge my indebtedness for literature and references to Prof. Dr. Bruno Galli-Valerio of Lausanne. F. C. HARRISON.

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I have the honor to be,

Your obedient servant,

F. C. HARRISON.

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PART XIII.

THE EXPERIMENTALIST.

To the President of the Ontario Agricultural College:

Sir,—I have the honor of submitting herewith my report of the work done in the Experimental department during the year 1902.

Field Agriculture, or Agronomy.

My work in connection with Field Agriculture, or Agronomy, for the past year may be summarized in a general way under the following heads:

1. Conducting experiments on about 2,000 plots of sufficient size, to enable us to ascertain the yields of the various crops under investigation. The results of this work are presented in this report.

2. Carrying on scientific work, especially in the hybridization of farm plants, along the line of the discoveries of Mendel and the investigations of De Vries, Correns, Bateson, and others.

3. Directing co-operative experiments on 3,135 farms throughout the Province. The co-operative experimental work in Ontario is exerting an influence which is wholesome in its character and far reaching in its results. For the reports of the co-operative work, the reader is referred to the Annual Report of the Ontario Agricultural and Experimental Union.

4. Delivering lectures to College students and agricultural conventions —about 100 in number. Within the past year, the writer has delivered lectures to about 100 students in the regular College course, 60 students in the dairy course, and 210 students in the short course in stock and grain judging. The other lectures which have been delivered since last year are about as follows: 31 at meetings of Farmers' Institutes; 30 in the experimental grounds to 20,000 to 25,000 excursionists who visited the College in the month of June; 3 at Seed Fairs; 3 at the "Model Fair" at Whitby; 1 at the Annual Meeting of the Canadian Fairs' Association, Toronto; 2 at the Annual Meeting of the Ontario Agricultural and Experimental Union; 1 at the Provincial Winter Fair, Guelph; 1 at the First National School of Agriculture for the United States, State University, Columbus, Ohio; and 4 in different school sections in connection with the proposed establishment of the first Consolidated Rural School in Ontario for the teaching of manual training, domestic science, nature study, and agriculture, along with the ordinary branches of elementary education.

5. Writing Report, Bulletins, and Agricultural Articles. (1) Report of the Experimental Department at the College; (2) Report of the co-operative experiments in agriculture in connection with the Ontario Agricultural and Experimental Union; (3) Bulletin on "Peas and the Pea Weevil"; (4) Part of a bulletin on "Nature Study or Stories in Agriculture"; (5) Miscellaneous articles for agricultural journals, newspapers, etc.

6. Carrying on a heavy agricultural correspondence. The amount of correspondence with Ontario farmers is increasing from year to year. For several weeks in the spring, and again in the fall, the number of letters and cards received daily average more than one hundred. Some of these enquiries take much thought and care in answering.

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7. Judging at agricultural exhibitions. In 1902, the writer acted as judge on farm crops at the following Agricultural Fairs: The Industrial Exhibition, Toronto; the "Model Fair," Whitby; the Agricultural Fair, Berlin; the Agricultural Fair, Wellesley; the Broadview Boys' Institute Fair, Toronto; the Spring Seed Fair, Guelph; the Fall Seed Fair, Guelph; and the Spring Seed Fair, Fergus. The exhibits of farm crops at the "Model Fair" at Whitby were much better, from an educational point of view, than those at most of the other fairs, for the following reasons: (1) The varieties were all correctly named; (2) the grain exhibits were represented by small sheaves, showing the length and quality of the straw, and the nature of the head, as well as by the threshed grain of each variety; and (3) some of the classes of roots, corn, millet, grasses, clovers, etc., were shown in the experimental plots on the grounds outside, as well as in the exhibits inside of the buildings.

Experiments at the College.

The practical work in the Experimental Department consists in planning the various experiments; laying out, seeding, and looking after the field plots; harvesting, threshing, weighing, and testing the grain; taking up, weighing, counting, testing, and storing the potatoes and roots; cutting, weighing, and harvesting the grass, corn, and fodder crops, etc.; and also in picking by hand the samples of grain grown on the plots, some to be sown on the plots the following year, and some to be distributed for co-operative experimental work throughout Ontario. But few people realize what a large amount of very careful thought is required in planning, supervising, and examining these crops, and in studying, comparing, and summarizing the results for presentation in reports, bulletins, newspaper articles, and lectures.

Experimental Grounds. About fifty acres of land, divided into more than 2,000 plots, is used for agricultural field experiments, conducted with varieties of grain, root, tuber, grass, clover, fodder, silage, and miscellaneous crops; with artificial, green, and farmyard manure; with methods of cultivation, selection of seed, dates of seeding, etc.—all with the greatest care, and for several years in succession—in order to secure strictly accurate and reliable results. These experiments deal with the crops grown on over nine-tenths of the cultivated land in Ontario; that is, fully 10,000,000 acres.

Experimental Plots. The experimental grounds have a gentle slope toward the southwest, and the soil is what might be termed an average clay loam. Nearly one-quarter of the land is manured each year with twenty tons (about twelve loads) of farm-yard manure per acre. It will thus be seen that the most of the land receives farm-yard manure once every four years. No commercial fertilizers are used, except in distinct fertilizer experiments, which occupy from two to three acres each year, and on which tests are made to ascertain the comparative value of different fertilizers with different crops. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yields of the plots in every instance.

Weather Conditions in 1902. Regarding the weather conditions of the past summer, we should carefully note a few points when considering the results of experiments with field crops. The month of March was exceptionally warm, and the month of June was very much cooler than usual. Owing to the unusually warm weather in the very early spring, we were enabled

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to sow our varieties of spring wheat on the 27th of March, which was fully two weeks earlier than the earliest seeding that has taken place on the College farm within the past fifteen years. The mean temperature in the month of June was about five degrees lower than the mean temperature in June for several years past. The total rainfall at the College, according to the determinations made by the department of Physics, was 6.4 inches, while that for July, 1901, was 4.1 inches, and for July, 1900, 3.1 inches. In fact, the rainfall throughout the whole summer was much larger than usual.

Results of Experiments.

All our field experiments are conducted for at least five years before any of them are dropped. For the results of many of the tests which were carried on for five years previous to 1902, the reader is referred to former reports. The results of some of the experiments which have as yet been conducted for only one or two years are held back until the tests can be carried through at least another summer. As different seasons vary so much in temperature, amount of rainfall, etc., the average results of experiments continued for several years are of much greater value than those secured from only one year's work. We submit the results with much confidence in their reliability, and in their real, practical value. The writer has had good reason to believe that the work of the Experimental department is being appreciated by the farmers of the Province, and that the results are being studied more and more each succeeding year. I shall limit my remarks on each separate experiment, the results of which are here presented, to a few of the points which seem to be of the greatest value to the agriculture of Ontario.

Selection of Seed Grain.

The average market annual value of the wheat, oats, barley, and peas grown in Ontario for the past twenty years is, according to the Reports of the Bureau of Industries, $57,709,840. Any improvements, therefore, which can be made in the choice of varieties, in the selection of seed, in the methods of cultivation, etc., which will increase the value of these crops 10 per cent. per annum will thereby increase the total value of these crops in Ontario by nearly $8,000,000 in a single average year. Believing that the majority of the farmers of Ontario were not obtaining so good results as they might if they sowed the very best quality of seed, a systematic line of experiments was started nine years ago, to ascertain the comparative results upon the immediate crop from a simple but careful selection of seed. The results obtained show the great importance of making a proper selection of seed if we hope to get the best returns. It should be clearly understood that the results which are here presented represent in every case only one season's influence. The experiments were repeated from six to nine years by starting with fresh seed in the spring of each year. The average results, therefore, of these various years, covering different conditions of moisture, temperature, and soil, are worthy of careful consideration. They show about what may be expected from a simple selection of seed upon the immediate crop, and give room for serious thought regarding the carelessness of some people in the preparation of seed for sowing on their farms from year to year. We are greatly pleased to know that many farmers are now taking much greater care as to the quality of

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the seed which they sow than they did in previous years, and we hope that many others may also be encouraged to greater carefulness in the selection of the seed which they sow in their fields.

In the experiments conducted in the selection of seed, it should be clearly understood that the different selections were made with great care, and were clearly defined in every case. For the large, plump seed, none but well-developed seeds were selected; for the small plump seed, the sample of grain selected was of a uniform character; and for the shrunken sample, none but shrunken grains were used—the last selection being made regardless of the size of the kernels. An equal number of grains of each selection was used, the object being to ascertain the comparative productiveness of the seeds of the different selections.

Winter Wheat. The experiment in making different selections of winter wheat has been conducted for six years in succession. The average results for the six years are as follows: Large plump seed, 46.9 bushels of grain per acre, 2.6 tons of straw per acre, and 59.4 pounds of grain per measured bushel; small plump seed, 40.4 bushels of grain per acre, 2.2 tons of straw per acre, and 59.2 pounds of grain per measured bushel; shrunken seed, 39.1 bushels of grain per acre, 2.1 tons of straw per acre, and 59.0 pounds of grain per measured bushel; and split seed, 9.3 bushels of grain per acre, 3-5 of a ton of straw per acre, and 54.2 pounds of grain per measured bushel. From the results here presented, it will be seen that the large plump seed gave decidedly the best results; that there was not very much difference between the small plump seed and the shrunkn seed; and that the split and broken seed gave exceedingly poor returns. When the grain of wheat is broken by the separator, in many cases the germ is either destroyed entirely or the kernel is so injured that it is not apt to produce a strong, vigorous growth.

Spring Wheat. The experiment in testing different selections of spring wheat has been conducted for a period of eight years. In averaging the results for the eight years, we have obtained the following summary: Large plump seed, 21.7 bushels of grain per acre, 1.4 tons of straw per acre, and 59.1 pounds of grain per measured bushel; small plump seed, 18.0 bushels of grain per acre, 1.3 tons of straw per acre, and 58.3 pounds of grain per measured bushel; and shrunken seed, 16.7 bushels of grain per acre, 1.2 tons of straw per acre, and 56.9 pounds of grain per measured bushel. It will be seen that the small plump seed gave poorer results than the large plump seed, and that the shrunken seed gave poorer results than the small plump seed in every particular.

Barley. Four selections of barley have been tested for six years. In averaging the results obtained from these experiments for the whole period during which they have been carried on, we have obtained the following averages: Large plump seed, 53.8 bushels of grain per acre; 1.5 tons of straw per acre, and 49.5 pounds of grain per measured bushel; small plump seed, 50.4 bushels of grain per acre, 1.5 tons of straw per acre, and 48.8 pounds per measured bushel; shrunken seed, 46.0 bushels of grain per acre, 1,4 tons of straw per acre, and 49.1 pounds of grain per measured bushel; and broken seed, 43.2 bushels of grain per acre, 1.3 tons of straw per acre, and 48.6 pounds of grain per measured bushel. It will be observed that the broken barley gave much better results than the split wheat. Those who have observed the result of the work of the separator in threshing will notice that the barley is usually broken crosswise, and that the wheat is usually split through the crease which extends from one end to the other. Therefore, the germ of the wheat is much more apt to be destroyed by the

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separator than the germ of barley. The principal reason that the broken seed of barley gives a less yield than any of the other selections is not so much the result of the injury done to the germ, as in the removal of about one-half of the kernel, which is then unable to supply the young plant with food sufficient to give it a good start.

Oats. For seven years an experiment has been conducted in selecting large seed, medium-sized seed, and small seed of oats. The average results obtained from these selections during the entire period of the experiment are as follows: Large seed, 62 bushels of grain per acre, 1.9 tons of straw per acre, and 33.2 pounds of grain per measured bushel; medium sized seed, 54.1 bushels of grain per acre, 1.8 tons of straw per acre, and 32.2 pounds of grain per measured bushel; and small seed, 46.6 bushels of grain per acre, 1.8 tons of straw per acre, and 31.8 pounds of grain per measured bushel. The results indicate that as the seed oat decreases in size, the plant becomes smaller and the yield of grain considerably less.

Peas. A test has been made for six years in comparing large peas with small peas of the same variety. The average results for each selection are as follows: Large seed. 28.1 bushels of grain per acre, 1.3 tons of straw per acre, and 56.3 pounds of grain per measured bushel; and small seed, 23.0 bushels of grain per acre, 1.1 tons of straw per acre, and 56.3 pounds of grain per measured bushel.

Another experiment has been conducted for nine years in succession in which sound peas have been compared with peas that were split in the process of threshing. The average results for the nine years' comparison gives us the following figures: Sound seed, 29.2 bushels of grain per acre, 1.4 tons of straw per acre, and 58.1 pounds of grain per measured bushel; and split peas, 10.2 bushels of grain per acre, 3-5 of a ton of straw per acre, and 57.9 pounds of grain per measured bushel. It should be remembered that the split and broken grain has an advantage over the other grain in the case of peas and wheat, owing to the fact that each plant which grows has more room for development than in the case of the other selections, where there is a more complete germination.

These results are certainly very suggestive throughout, and indicate very clearly the great importance of taking special pains in the selection of the seed sown.

Grains Grown in Mixtures for the Grain and Straw.

For six years in succession, a comprehensive experiment was conducted in growing oats, spring wheat, barley, and peas separately and in various combinations for the production of grain and straw. It was found that a mixture of oats and barley gave the highest yield of grain per acre; and having ascertained that a mixture of oats and barley was well adapted to a large production of grain, it became of importance to know the best proportions of these grains to use in the mixture to give the most satisfactory returns.

Barley and Oats. It was decided in the spring of 1900 to conduct an experiment in sowing nine different proportions of oats and barley in order to determine which mixture and which quality of seed would give the best results in the production of grain and straw. The following gives the amounts of oats and barley per acre used for seed in the different mixtures: (1) Oats, 1-2 bu. and Barley, 1-2 bu.; (2) Oats, 1-2 bu. and Barley, 1 bu.; (3) Oats, 1-2 bu. and Barley, 1 1-2 bu.; (4) Oats, 1 bu. and Barley, 1-2 bu.; (5) Oats, 1 bu. and Barley, 1 bu.; (6) Oats, 1 bu. and Barley, 1 1-2 bu.; (7) Oats,

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1 1-2 bu. and Barley 1-2 bu.; (8) Oats, 1 1-2 bu. and Barley, 1 bu.; (9) Oats, 1 1-2 bu. and Barley, 1 1-2 bu. This entire experiment was conducted in three places in our experimental grounds in 1900, and again in 1901, and in two places in 1902. In the average results for the three years, the three mixtures which produced the greatest yields of grain per acre were as follows:

1 bushel of Oats and 1 bushel of Barley, 2,201 pounds; 1 bushel of Oats and 1 1-2 bushel of Barley, 2,178 pounds; and 1 bushel of Oats and 1-2 bushel of Barley, 2,161 pounds. In yield of straw per acre, the three mixtures here mentioned and the mixture of 1 1-2 bushels of Oats and 1 1-2 bushels of Barley per acre produced the greatest average yields. The lowest average yield of grain per acre was produced by the heaviest seeding, and the second lowest by 1 1-2 bushels of Oats and 1-2 bushel of Barley per acre.

Barley and Oats, with Wheat, etc. Although the experiment described in the first paragraph under the last general heading showed that various combinations of oats, barley, spring wheat, and peas had been used in combination for the production of grain, we wished to conduct the experiment still further to ascertain whether a mixture of oats and barley which had given good results could be improved by the addition of some other grain. An experiment was, therefore, conducted in 1902 by sowing a mixture of 1 bushel of oats and 1 1-2 bushels of barley per acre as a basis of comparison. For each of the other mixtures, the same quantity of oats and barley was used, and, in addition, 1-2 bushel per acre of the following grains: Wild Goose spring wheat, Emmer, Grass Peas, and Flax. The experiment was conducted in duplicate. The average results of the two tests for 1902 were as follows: (1) Oats and Barley, 2,183 pounds; (2) Oats, Barley, and Spring Wheat (Wild Goose), 2,273 pounds; (3) Oats, Barley, and Emmer, 2,207 pounds; (4) Oats, Barley, and Grass Peas, 2,159 pounds; (5) Oats, Barley, and Flax, 2,180 pounds per acre. It will, therefore, be seen that in this experiment, which has been conducted for only one year as yet, the greatest yield was produced by adding a small quantity of Wild Goose Spring Wheat to the mixture of oats and barley.

Twelve Kinds of Grain Grown in Combination. In order to ascertain how different varieties of farm crops would stand crowding, twelve sorts were selected and equal quantities of seed were mixed together and sown in combination. The experiment was conducted in duplicate. After the crops were harvested and threshed, the grain was carefully examined. The twelve varieties produced grain in the following order, starting with the largest production and finishing with the smallest: Mandscheuri Barley, Joanette Oats, Black Hulless Barley, Siberian Oats, Rye, White Hulless Barley, Emmer, Wild Goose Spring Wheat, Prussian Blue Peas, Flax, Grass Peas, and Common Vetches.

Another somewhat similar test, consisting of ten plots, was also made; but the detailed results have not yet been made out; so they will be held over for future publication.

Treatment of Oats and Winter Wheat for Smut.

Great damage has been caused in Ontario during recent years by the loose smut of oats and the stinking smut of wheat. In order to glean information regarding the relative values of several treatments which are recommended for the prevention of smut, experiments have been conducted at the College by making a practical application of these treatments and

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then watching the results carefully. The results here given for oats are for one year only, but for wheat they are for the average of four years.

Treatment of Oats for Loose Smut. Two varieties of oats were selected in the spring of 1902, and uniform samples from each variety were submitted to special treatments, with the object of killing the spores of smut adhering to the grain. The various treatments were as follows:

(1) Immersion in Hot Water. For this treatment, the grain was placed in a bag, which was then immersed in water at about 115 degrees F. Soon afterwards it was placed in water which was kept at a temperature between 130 degrees and 135 degrees F. The grain was occasionally stirred and was allowed to remain in the water for a period of fifteen minutes. It was then spread out on a clean floor to dry, where it was stirred occasionally.

(2) Immersion in Bluestone Solution for Five Minutes. For No. 2 treatment, a strong solution was made by dissolving one pound of Copper Sulphate (Bluestone) in one gallon of water, and then immersing the oats in the solution for a period of five minutes.

(3) Immersion in Bluestone Solution for Twelve Hours. In this treatment, the bluestone solution was made by dissolving one pound of bluestone in 25 gallons of water, and the oats were immersed in this solution for a period of twelve hours.

(4) Sprinkling with Bluestone Solution. This solution was made by dissolving one pound of bluestone in 10 gallons of water, which was used for sprinkling over the oats until they were thoroughly moistened after being carefully stirred.

(5) Immersion in Potassium Sulphide Solution. The potassium sulphide treatment consisted in soaking the seed for two hours in a solution made by dissolving 8 pounds of potassium sulphide in 50 gallons of water.

(6) Immersion in Diluted Formalin. The solution of formalin used for the immersion process was made by pouring one-half pint of the formalin into 21 gallons of water, and the seed oats were immersed in the solution for twenty minutes.

(7) Sprinkling with Diluted Formalin. One-half pint of formalin was poured into 5 gallons of water. The oats were then sprinkled with this solution and carefully stirred until the grain was thoroughly moistened.

(8) Untreated. One sample of oats of each variety was left untreated in order that the influence of the various treatments might be observed.

Eight lots of oats of each variety were, therefore, used for this experiment. After the treatments had been completed a few hours, the oats were carefully sown on sixteen separate plots. Each plot was exactly one square rod in size. Between the 7th of July and the 6th of August, eight careful examinations were made, and all the smutted heads in each plot were removed and counted. The following table gives the average results in the percentage of smutted heads of oats from each treatment:

Treatments.	Percentage of Smutted Heads of Oats.
1. Immersion in hot water	.0
2. Immersion in bluestone solution for five minutes	1.7
3. Immersion in bluestone solution for twelve hours	.6
4. Sprinkling with bluestone solution	.9
5. Immersion in potassium sulphide solution	3.4
6. Immersion in diluted formalin	.0
7. Sprinkling with diluted formalin	.0
8. Untreated	5.5

From the results here presented, it will be seen that where the oats

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were untreated, 5 1-2 per cent. of the crop was destroyed by smut; and also that the treatments with hot water and formalin were very effective. As the market value of oats throughout Ontario for the past twenty years has been upwards of $20,000,000 a year, it will be seen from the above results that it is possible to make a difference of about $1,000,000 in the value of oats in Ontario in a single season by carefully treating the seed, and destroying the smut spores before the oats are sown.

Treatment of Winter Wheat for Stinking Smut. In the average of four years' tests, seed wheat infested with smut spores produced grain containing the following number of smut balls per pound of wheat: Untreated, 456; treated with potassium sulphide, 11; treated with copper sulphate (Bluestone), 2; and treated with hot water, 1.

The copper sulphate (Bluestone) treatment consisted in soaking the seed for twelve hours in a solution made by dissolving one pound of copper sulphate in 24 gallons of water, and then immersing the seed for five minutes in lime water, made by slacking one pound of lime in 10 gallons of water. The hot water treatment consisted in immersing the wheat for fifteen minutes in water at 132 degrees F. After each treatment the grain was spread out and stirred occasionally until dry enough to sow.

Methods of Cultivation.

An interesting experiment has been under way for two years in cultivating land in different ways for oats and barley. The four methods of cultivation followed at the time when the grain was sown were as follows: (1) Cultivated 6 inches, drilled, rolled, and harrowed; (2) Cultivated 3 inches, drilled, rolled, and harrowed; (3) Cultivated 3 inches, drilled and rolled; and (4) Cultivated 3 inches, and drilled. The results of these experiments are somewhat irregular, owing, no doubt, to the peculiar weather conditions of the last two years, and especially those of 1902. This experiment will likely be repeated for several years, and in time we hope to obtain results which may prove of some practical value.

A Comparative Test of Ten Different Classes of Grain.

Much has been done in an experimental way in testing different varieties of nearly all classes of farm crops. But very little has yet been done

Varieties.	Date of ripening.	Average height.	Amount lodged.	Amount of rust.	Yield of straw per acre.	Yield of grain per acre.
		inches.	per cent.	per cent.	tons.	lbs.
Emmer	Aug. 12	35	1	1	1.7	2384
Joanette Oats	" 7	35	1	5	1.5	2217
Mandscheuri Barley	July 30	35	3	2	1.8	2113
Wild Goose Spring Wheat	Aug. 25	42	1	2	1.8	1853
Black Hulless Barley	July 29	28	9	3	1.2	1825
Alaska Oats	" 30	37	2	4	1.3	1783
White Hulless Barley	" 29	28	12	4	1.1	1541
Spring Rye	Aug. 12	48	.....	2	1.6	1364
Prussian Blue Peas	Sept. 2	52	.....	.....	2.5	1279
Common Vetches	" 3	41	....	.....	2.0	1040

to ascertain the comparative yields of leading varieties of the different classes of farm crops under similar conditions. An experiment was conducted at the College in 1902 for the first time, in order to obtain some

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definite information regarding the comparative yields of different classes of farm crops when grown and handled under as nearly uniform conditions as possible. The seeding took place on April 24th, and the experiment was conducted in duplicate. The following table gives the average results of growing ten varieties of farm crops under similar conditions and in duplicate in 1902.

It will be seen from the results here presented that the Emmer produced the greatest amount of grain, the yield being 117 pounds per acre more than that produced by the Joanette oats, and 221 pounds per acre more than that produced by the Mandscheuri barley. The grain of the Emmer is somewhat similar to that of the Wild Goose spring wheat; but it is enclosed in a hull somewhat resembling the hull of the oat. A more detailed description of Emmer is given further on in this report. Of the crops under experiment, the Hulless barleys were the earliest, and the common vetches were the latest to mature. The White Hulless and the Black Hulless varieties of barley possessed short, light, weak straw, as will be seen from the table of results. This experiment will likely be repeated in future years.

As some of the same varieties of crops were distributed throughout Ontario in the spring of 1902 for co-operative experiments, a reference to the results obtained will be interesting for comparison with the results at the College. It should be understood that the crops grown throughout Ontario were the averages of a large number of tests made on separate farms. The average soils on which any one crop would be grown would, therefore, not be exactly the same as the average soils used for the experiments with other crops.

Crops.	Tons of Straw per acre.	Lbs. Grain per acre.
Emmer	1.9	2,126
Siberian Oats	1.7	1,737
Mandscheuri Barley	1.6	1,672
Black Hulless Barley	1.5	1,536
Alaska Oats	1.4	1,398
Wild Goose Spring Wheat	1.7	1,302
White Hulless Barley	1.4	1,278
Early Britain Peas	1.2	1,166

It will be observed that the comparative order in yield of grain per acre throughout Ontario was very similar to that at the College.

Varieties of Spring Wheat for Flour Production.

Different classes of spring wheat are now grown in the experimental grounds and throughout Ontario for three distinct purposes, viz.: (1) For the production of flour, such as the Red Fife variety; (2) For the production of macaroni, such as the Wild Goose variety; and (3) For the production of food for live stock, such as the Russian Emmer, or the red variety of Spelt. As a result of the experiments in testing varieties of spring wheat for the production of flour, we have found the Red Fern and the Red Fife to be among the best varieties. These are old standard sorts, which compare very favorably with other varieties when both yield and quality of grain are taken into consideration. The Colorado, also called the Speculation or Thick-set, yields a little more than the varieties here mentioned, but possesses grain which is somewhat softer. Several new varieties were imported from Germany, the Argentine Republic, and from other places in-

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1902. The results of the tests for one year show that a few of these varieties give fairly good returns, viz., Rolben (Ger.), 24 bu.; and Climax (U. S.), 16 bu. per acre.

Macaroni Wheat.

Owing to the foreign demand within the past few years for Wild Goose spring wheat for use in the manufacture of macaroni, an increased interest has been aroused in those varieties of spring wheat specially suited for macaroni manufacture. The Wild Goose variety is the only one generally known throughout the Province of Ontario suitable for this purpose. For ten years in succession, six varieties of macaroni wheats have been under experiment at the College. The average of ten years' results in yield of grain per acre are as follows: Wild Goose, 38.4 bu.; Medeah, 33.8 bu.; Bart Tremenia, 33.4 bu.; Sorentina, 33 bu.; Algiers, 31.1 bu.; and Ontario, 20.9 bu. per acre. In average weight per measured bushel, only two varieties exceed the standard of 60 pounds, namely, the Wild Goose, 61.1, and the Bart Tremenia, 60.8 pounds. The Medeah, however, comes next, with only about two-fifths of a pound per measured bushel under the standard. The Medeah is a very early variety, and on some soils and under certain conditions, may surpass the Wild Goose variety; but for general cultivation throughout the Province, there is no other variety grown which is likely to give so good satisfaction for growing to export for macaroni manufacture as the Wild Goose wheat.

Varieties of Spring Wheat for Feeding Live Stock.

Two classes of spring wheat, which are distinct from one another as well as from those types of spring wheat which are particularly grown for the production of flour or macaroni, are grown specially for the production of food for live stock. These two classes will be taken up under the separate headings of Spelt and Emmer.

Spelt (*Triticum spelta*) is a cereal which in appearance is intermediate between wheat and barley, but in reality is one of the types into which wheat is divided. It is a native of the countries near the Mediterranean Sea. At the present time, it is grown principally on the poorer soils in Switzerland, Southern Germany, and Northern Spain. It is also grown at an elevation in Switzerland where the common wheat (*Triticum staivum*) will not thrive. For general cultivation, it is considered much inferior to the finer varieties of wheat. The head is open, narrow, bearded or bald, and is usually very long. When the grain is threshed, the head breaks into pieces at the different joints or nodes, leaving the grain still clasped firmly by the chaff. In order to make a separation of the chaff from the seed, special machinery is required. The grain is medium hard, and somewhat compressed at the sides.

To find out the value of Spelt for growing in Ontario, we have imported at different times no less than ten varieties from Switzerland, Russia, Germany, the Argentine Republic, and the United States. Two of these varieties proved entire failures, two others gave poor results, and the other six varieties yielded moderately well. As the grain is enclosed by a chaff somewhat similar to oats, and weighs only about 40 pounds per measured bushel, the results here presented are given in pounds, instead of bushels of grain per acre. One of the best varieties of Spelt has now been grown in the experimental plots for four year. and has given

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an average yield of 1,276 pounds of grain per acre. The yields per acre of the varieties of Spelt grown in 1902 were as follows: Red Spelt, 1,661 pounds; Alstroum Spelt, 1,466 pounds; German Spelt, 1,420 pounds; and White Summer Spelt, 1,263 pounds. The grain as here reported contained the following percentages of hull: Red Spelt, 32 per cent.; Alstroum Spelt, 33 per cent.; German Spelt, 28 per cent.; and White Summer Spelt, 31 per cent. A considerable amount of the grain grown throughout Ontario under the name of Spelt is improperly named, as it belongs to a different species of wheat known as Emmer.

Emmer (*Triticum dicoccum*) is a cereal which represents a different type of wheat from any of those already described in this report. It is grown in Russia, Germany, Switzerland, Spain, France, Italy, and to a slight extent in some other countries. In Russia alone, about sixteen million bushels are produced annually.

As in the case of Spelt, the grain of the Emmer is tightly enclosed within the chaff, from which only a small portion is separated, even in the process of threshing. In comparison with the Spelt, however, the heads are much shorter and more compact, and the grain is more triangular in form and very much harder. The spikelets of the Emmer overlap each other like shingles on a roof, which makes the head close, smooth, and regular. The heads are nearly always bearded and the chaff is usually harder than that of the Spelt. The portion of the stem adhering to the spikelets after threshing is much smaller and more pointed in the Emmer than in the Spelt. The spikelets of the Emmer are flattened on the inner side, while those of the Spelt are arched. Emmer is considered a very hardy plant, being much superior to the Spelt in this respect.

Emmer has been grown in the Experimental department for three years, and it has produced very heavy yields of grain per acre. The yields in each of the past three years are as follows: 1900, 2,608 lbs.; 1901, 2,123 lbs.; 1902, 2,252 lbs.; thus making an average of 2,327 lbs. per acre. The weight per measured bushel was 43.8 lbs. in 1900; 33.8 lbs. in 1901, and 36.6 lbs. in 1902, the average being 38 lbs' per acre. It will, therefore, be seen that the average yield of Emmer per acre for the past three years has been upwards of 60 bushels per acre by measure. The grain of Emmer when threshed has a less percentage of hull than that of Spelt, the average of the former being about 25 per cent., and that of the latter, 30 per cent., in the result of the experiments conducted at the College. Emmer is very much freer from rust, but is a little weaker in the straw than Spelt. On the whole, the Emmer has given much better results than Spelt in the experiments at the College.

Emmer was distributed for co-operative experiments throughout Ontario in 1901, and again in 1902, and the yields produced throughout the Province were very large. From the results of our experiments with Emmer, we believe that it will be more generally grown throughout Ontario for the production of straw of good quality and of grain to be ground for feed for live stock. The cereal which is now grown in many localities throughout Ontario under the name of Spelt is, in reality, not Spelt, but Emmer.

Varieties of Spring Rye.

Six varieties of spring rye were grown in the experimental plots in the spring of 1902. Two of these were foreign varieties, grown this season for the first time, and they gave very poor results, one yielding no grain what-

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ever, and the other only about 3 bushels per acre. The other four varieties, however, gave very good results. The Dakota Mammoth, Prolific Spring, and Common varieties each yielded about 34 bushels per acre, while the Colorado Giant produced about 29 bushels per acre. These four varieties have been grown from three to five years, with the following average results in yield of grain per acre: Dakota Mammoth, 40.2 bu.; Prolific Spring, 36.9 bu.; Common, 34.9 bu.; and Colorado Giant, 25.8 bu.—the weight of rye being 56 lbs. per measured bushel.

Varieties of Oats.

Seventy-two varieties of oats were grown in the experimental plots in 1902. A few of these varieties have now been tested under similar conditions for twelve to fourteen years in succession. In the average results for twelve years, the yield per acre of the Siberian variety has been 88.6 bushels, and that of the American Banner, 84.7 bushels. Although the Banner gave an average yield of nearly one bushel per acre more than the Siberian in 1902, the Siberian has surpassed the Banner by an average of nearly four bushels per acre for each of the past twelve years. These two are among the leading varieties for general cultivation throughout Ontario. The Oderbrucker, Probsteir, Waterloo, Bavarian, etc., have also made good records in the average results over a long series of years.

Twenty-two varieties of oats were grown in the experimental plots in 1902 for the first time. Most of these were imported from Germany, England, Scotland, the Argentine Republic, and the United States. The following are the yields per acre produced by some of these newly imported varieties: Zoll-inholtserklarung (Ger.), 98 bu.; Leutewitzer (Ger.), 89 bu.; Tartar King (Eng.), 82 bu.; Waverley (Eng.), 80 bu.; Gold Finder (Eng.), 73 bu.; and Pioneer (Eng.). 67 bu. None of these varieties, however, yielded so heavily as either the Siberian or the American Banner.

Varieties of Six-rowed Barley.

The varieties of six-rowed barley which produced the largest yields of grain per acre in 1902 were as follows: Mandscheuri, 86 bu.; California Brewing, 80 bu.; Common Six-rowed, 77 bu.; and Oderbrucker, 75 bu. Among fifteen varieties which were imported and grown in 1902 for the first time, the following kinds gave the largest yields of grain: Hanna No. 5590 (Iowa), 72 bu.; New Awnless, 71 bu.; and Triumph, 70 bu.

Of the ten varieties of six-rowed barley which have been grown for nine years in succession, the greatest yields were, in the order given, produced by the Mandscheuri, California Brewing, Scotch Improved, Common Six-rowed, and Oderbrucker; and the lightest yield per acre was produced by the Success, a beardless variety.

Varieties of Two-rowed Barley.

Two-rowed barley is grown but to a very limited extent throughout Ontario. For certain purposes, however, it fills an important place among the cereal crops of the Province. It is becoming more and more the practice to grow grains in mixture for the production of both green fodder and grain. Among eleven mixtures of grain tested for a period of six years, it was found that oats and barley produced the largest yield of threshed grain per acre. In order, however, to secure a crop which ripens uniformly,

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it is necessary to select a late variety of barley to be used with an ordinary variety of oats, or a very early variety of oats to sow with an ordinary variety of barley in order to have the two mature at the same time. The Chevalier has been found to be an admirable variety to mix with either the Siberian or the Banner variety of oats. In the results of testing eight varieties of two-rowed barley for a period of nine years, the French Chevalier and the New Zealand Chevalier varieties each produced 62 bushels per acre, and were among the greatest yielders of all the two-rowed barleys. The Duckbill variety gave an average yield of about three bushels per acre less than either of the strains of the Chevalier barley.

Varieties of Hulless Barley.

A considerable amount of Hulless barley is grown in some parts of Ontario, especially in those sections where the "pea-bug" (weevil) has been doing serious damage to the pea crop in recent years, and where the farmers are using the Hulless barley as a partial substitute for the pea crop. The yield of grain of the Hulless barley is usually very good; but, generally speaking, the straw is weak. When sown with oats, however, the crop seems to stand up rather better than when sown alone.

In 1902, eleven varieties of Hulless barley were under test at the College, the greatest yields being produced by the following: Guy-Mayle, 65 bu.; Black Hulless, 61 bu.; Hungarian, 60 bu.; and Winnipeg No. 2, 58 bu.—the standard of 60 pounds per measured bushel being used in every case. Eight of these varieties have now been grown for nine years in succession, with average yields per acre as follows: Guy-Mayle, 48 bu.; Black Hulless, 45 bu.; Purple, 44 bu.; Guymalaya, 42 bu.; Winnipeg No. 2, 41 bu.; Hungarian, 41 bu.; Large Skinned, 40 bu.; and Smooth Hulless, 38 bu. In average weight per measured bushel for the nine years, the Purple variety went 63 and the Black Hulless 62 pounds.

Winter Barley.

Winter barley has been tested in the plots more or less in each of the past twelve years. When the winters have been unfavorable, however, the barley has usually been winter killed, but in those seasons in which the barley could survive the winter the results have been exceedingly good. In fact, the average yield per acre of winter barley produced in each of five favorable years has been 72.5 bushels per acre. If winter barley could be depended upon to survive the average Ontario winter, it would likely surpass the best spring varieties in yeld of grain per acre. Unless we can secure some hardier varieties, however, than we have at present, there is a good deal of risk in sowing large areas with winter barley in Ontario.

Varieties of Winter Wheat.

Ninety-five varieties of winter wheat were grown at the College this year. The ten varieties giving the greatest yield of grain per acre, starting with the highest, were as follows: Extra Early Windsor, Dawson's Golden Chaff, Imperial Amber, Pedigree Genesee Giant, Prize Taker, Economy, New Columbia, White Golden Cross, Early Ontario, and Johnson. The Extra Early Windsor very closely resembles the Dawson's Golden Chaff variety. Those varieties possessing the stiffest straw were the Dawson's Golden Chaff, Extra Early Windsor, Clawson Longberry, and American Bronze.

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Experiments have shown that the sprouting of wheat greatly injures it for seed as well as for flour production. All of the varieties at the College this season were more or less sprouted before they could be harvested. Those varieties which sprouted the least were the Red Cross, McPherson, Wisconsin, Triumph, and Reliable, and those which sprouted the most were Pedigree Genesee Giant, Early Arcadian, and Oregon. Fifty-seven varieties were sprouted less and thirty-seven varieties were sprouted more than the Dawson's Golden Chaff. The varieties without beards were sprouted as badly as those with beards, and the hard wheats were sprouted slightly more than the softer varieties. The white wheats, as a class, however, were sprouted much worse than the red varieties.

A deputation of ten persons from the Dominion Millers' Association visited the College last summer, and, after examining the different varieties of winter wheat, recommended that the following varieties be grown extensively in Ontario: (1) Red Wheat—Michigan Amber and Turkey Red; (2) White Wheat—Early Genesee Giant and Bulgarian.

Miscellaneous Experiments with Winter Wheat.

Quantities of Seed per Acre. From sowing one, one and one-half, and two bushels of winter wheat per acre for six years, average yields of 40.2 bu., 43.3 bu., and 43.9 bu. per acre, respectively, were obtained. As two varieties of wheat were used each year, these averages represent twelve distinct tests.

Methods of Sowing. Winter wheat which was sown broadcast by hand gave practically the same results as that which was drilled in with a machine in the average results of tests made for eight years. The land was in a good state of cultivation in every instance.

Dates of Sowing. Winter wheat sown at the College during the last week in August or the first week in September yielded better than that sown at a later date in the average results of tests made continuously for eight years. In 1902 the highest average yield was obtained from sowing on September 2nd, 1901.

Preparation of the Land. In an experiment conducted for four years, winter wheat grown on land on which a crop of field peas was used as a green manure, produced an annual average of 22.1 per cent. more wheat per acre than on land where a crop of buckwheat was plowed under. In another experiment which was carried on for one year, winter wheat grown on land prepared from clover stubble produced 20.7 per cent. more wheat per acre than on land prepared from timothy stubble. In a two years' test with commercial fertilizers, an application of 160 pounds of nitrate of soda per acre increased the yield of wheat 18.8 per cent., or 7.2 bushels. The present price of nitrate of soda is about $65 per ton.

Value of Seed from Wheat Cut at Different Stages of Maturity. For seven years in succession five plots of each of two varieties of winter wheat were sown at the same time in the autumn, and cut at five different dates in the following summer—a week being allowed between each two dates of cutting. Seed from each of the seventy cuttings was sown and the crop therefrom was harvested when ripe. In the average results of these tests it was found that the heaviest weight of grain per measured bushel and the largest yield of both grain and straw were produced from seed taken from the crops which had become very ripe by remaining uncut for the longest period of time.

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Winter Rye.

Five varieties of winter rye have been under experiment at the College within the past eight years. Only three kinds, however, were grown in the plots in 1902, namely, Common, Monster, and Mammoth. The Monster and the Mammoth varieties are similar in many respects, although the Mammoth variety has surpassed the other slightly in yield of grain per acre. The average results of the three varieties for four years are as follows: Mammoth Rye, 57.4 bushels per acre; Monster, 54.9; and Common, 52.

Varieties of Buckwheat.

Three varieties of buckwheat have been grown in our experimental grounds for seven years in succession, and the average results of those seven years, it is found that the Japanese has given 20.8 bushels; the Silver Hull, 17.8 bushels; and the Common Grey, 16 bushels of grain per acre. In the production of straw, it is also found that the Japanese is the heaviest yielder, producing an average of 2.9 tons per acre; while the Silver Hull produced 2.8 tons, and the Common Grey, 2.6 tons.

Varieties of Corn for Grain.

For three years in succession, nineteen early varieties of flint and dent corn have been carefully tested for the production of grain. The yields in 1902 were less than in either of the two previous years. The greatest yields this year were produced by the Dakota Gold Dollar (44.8 bu.), Longfellow (44.3 bu.), Farmers' Friend (41.5 bu.), Bailey's Mahogany (41.3 bu.), and Canada Yellow (40.8 bu.) The varieties which produced the greatest yields of shelled corn per acre in the average of three years were the King Phillip, 64.2 bu.; Genesee Valley, 62.7 bu.; North Star Yellow Dent, 61.1 bu.; Pride of Canada, 59.9 bu.; and Longfellow, 58.9 bu. The North Star Yellow Dent variety, which gave such excellent results in 1900 and in 1901, did not seem to be so well suited to the peculiar conditions of weather which prevailed throughout the growing season of the present year. There is a considerable amount of difference in the comparative percentage of cob to ear in the different varieties, as, for instance, in the average of the past three years the Farmers' Friend and the Salzer's Early Ripe varieties each gave 81 per cent. of grain from the ears, while the Burlington Hybrid and the Compton's Early varieties gave only 73 per cent. of grain from the ears. In 1902, the amount of grain as compared with the unshelled corn varied from 81 per cent. to as low as 62 per cent., according to the variety.

Varieties of Sunflowers.

Seven varieties of sunflowers have been grown in the Experimental department within the past few years. The two principal objects in view were to ascertain the comparative yields of the different varieties in the production of heads for putting into the silo with corn, and to determine the comparative yields of seed per acre. Several of the varieties gave rather poor results, and were dropped from the list. Three kinds, however, have given good yields, and have now been under experiment for a period of five years. The following are the average yields of seed per acre: White Beauty, 66.3 bu.; Mammoth Russian, 64 bu.; and Black Giant, 57.5 bu. In 1902, the white Beauty gave a very heavy yield of seed per acre, viz., 80.9

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bushels, while the Black Giant produced 67.5 bushels, and the Mammoth 60.7 bushels per acre. In reckoning the yield per acre, the standard of twenty pounds per measured bushel was used throughout. In yields of heads per acre, the Black Giant produced the largest in 1902, and also in the average of the five years in which these varieties were under experiment. A person wishing to grow sunflowers will not make a mistake by selecting any one of the varieties here mentioned.

Varieties of Millet for Seed.

In 1894, 1898, 1900, 1901, and 1902, different varieties of millet were allowed to ripen, to ascertain the comparative results of the different varieties in yield of seed per acre. In the average results for these years, the California and the Siberian varieties have both produced very large yields of seed, each variety surpassing the Hungarian Grass by about 4 bushels per acre. The Japanese Panicle Millet has made high records in yield of seed per acre in some seasons; but, as it is somewhat slower in maturing than other varieties, it gives the best results for seed production in those seasons in which the growth is not prolonged over so long a period as it was in 1902. The varieties here referred to have given an average yield of seed per acre about double that produced by the Common millet.

Field Peas.

A bulletin has recently been prepared by Prof. Lochhead and myself on the subject of "Peas and the Pea Weevil." This bulletin has been forwarded to the Department of Agriculture, Toronto, and will likely be printed and distributed in a short time. For a full account of the results of past experiments with field peas, the reader is, therefore, referred to the bulletin here mentioned.

The following gives the conclusion and recommendations as set forth in the bulletin regarding the eradication of the pea weevil in Ontario:

Conclusion. While we believe in the value of fumigation with carbon bisulphide in the fight against the pea weevil, we as firmly believe that it is not practicable to fumigate all the weevils which attack the peas grown in Ontario annually on an area of about 500,000 acres.

Recommendations:

(1) That the growing of both field and garden peas (to be ripened) in the weevil-infested districts of Ontario be discontinued for the next two years, and that such crops as Grass peas, Early Yellow Soy beans, Emmer (improperly called Spelt), mixed grains, etc., be substituted;

(2) That the acreage of both field and garden peas of the very best varieties be largely increased in those sections of the Province where there is no pea weevil;

(3) That seedsmen, farmers, and others send no infested peas into those districts of Ontario where the pea weevil does not exist;

(4) That if any persons persist in growing and ripening peas in the infested districts, it be insisted that they make the best possible use of the fumigation method; and

(5) That farmers, gardeners, seedsmen, millers, exporters, importers, and all others who have anything to do with the growing or the handling of peas in Ontario, co-operate heartily with one another and with the Government in the effort to eradicate the pea weevil from Ontario within the next two years.

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No varieties of peas were sown in the early spring of the present year. A few varieties, however, were sown in the experimental plots on the 25th of June, in order to find out whether the pea weevil would damage the crop when sown at a date so late in the season. As a result of the experiment, it was found that the highest yield per acre produced by any one of the fifteen varieties was 13 bushels; and that only five of the varieties gave upwards of ten bushels per acre. The small yields can, of course, be accounted for by the late sowing, and by the very unfavorable season. A very important feature of this experiment is that the New Zealand Field variety of peas, which gave the largest yield of grain per acre, produced peas of which 71 per cent. were infested with the pea weevil. It will, therefore, be seen that by sowing peas even as late as the 25th of June, we cannot expect to escape the ravages of the pea weevil in those sections which are badly infested with this troublesome insect.

Grass Peas.

The Grass pea is a leguminous plant, which produces long, flat vines; slender leaves; white blossoms; medium-sized pods; and hard, angular, white, or greenish white, seeds. It is entirely proof against the attacks of the pea weevil. In many respects, it resembles the Bitter Vetch (*Lathyrus sativus*) of Europe, which, however, has blue flowers and brown seeds. It also appears to be free from the poisonous principle which the Bitter Vetch is said to possess. This is borne out by the scientific investigations which have been made, and by the extensive and satisfactory use of the Grass peas as a food for farm stock. They are highly prized as a regular farm crop in some sections of Southern Ontario, where they have been extensively grown and fed for several years. They have been largely used as a substitute for the ordinary field peas in some of those districts in which the pea weevil has been doing serious damage for many years. In 1902, however, Grass peas, as well as nearly all other leguminous crops, were a partial failure, owing to the cold, wet weather of the past summer. The yield of the Grass peas in 1901 was also below the average in some localities, owing to the very hot weather at the time of blossoming. For feeding purposes, they seem to compare favorably with the ordinary field peas. They are usually sown alone, but sometimes with oats and barley. The crop may be used as green fodder, or as hay, or may be ripened for the production of grain, for which purpose, one and one-half bushels of seed per acre is usually sown with a grain drill. The straw is richer than that of any of the ordinary grain crops. The peas are very hard; but, when ground, they make a rich meal, that is relished by cattle, sheep, and hogs. The meal of Grass peas, being rich in flesh-forming constituents, should form not more than one-third of the entire meal ration for farm stock. In this respect, it is very similar to the meal of ordinary field peas. Grass peas, however, cannot take the place of garden peas for table use, nor of field peas for the export trade.

Grass peas have been grown in the trial grounds at the College for nine years, and have given good results, except in 1902, when they were a partial failure, owing to the cool, wet weather, and excessive rainfall. In the average results of tests made for a period of seven years, it is found that the annual yield of grain has been 25.7 bushels, and the yield of straw 2.2 tons per acre. In 1900, the yield was slightly over 43 bushels per acre. The grain has been exceptionally heavy, the average weight per measured bushel being about 64 pounds. In comparing the results of Grass peas with

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the Golden Vine peas (the common, small, white pea of Ontario) for a period of seven years, we find that the latter gave an average annual yield of grain of 1.4 bushels per acre more than the former; but that the former gave a yield of 4-5 of a ton of straw per acre, and grain which weighed fully 4 pounds per measured bushel more than the latter.

The average results of twenty-seven co-operative experiments conducted throughout Ontario in 1901 show that the Grass peas gave about 3-4 of a bushel per acre less than the Early Britain variety, and 1-2 a bushel per acre more than the White Wonder variety.

To make a comparative test of the value of Grass peas and Common Tares, or vetches, for green fodder, seed of these varieties was distributed throughout Ontario for co-operative experiments, in the years 1897, 1898, 1899, 1900, and 1901. The average results of all the carefully conducted experiments for the five years, show that the Grass peas gave a yield of 6.7 tons, and the common tares, or vetches, a yield of 6.8 tons per acre.

Egyptian Peas.

The Egyptian pea is a leguminous plant, grown extensively in the Mediterranean regions and in Central Asia. It has many common names, such as, Coffee Pea, Chick Pea, Idaho Pea, Gipsy Pea, etc., and is scientifically known under the name of *Cicer arietinum*. It has been used as a food for cattle, and also as an article for human food, for upwards of 3,000 years. The seed is somewhat larger than that of the common pea, and is enclosed in a short, thick, hairy pod, there being from one to two peas in each pod. The plant itself is seldom used, except as a soil renovator, but the yield of grain is large, when ground into meal, makes a very valuable stock food, fed in much the same way as cotton seed meal. The straw is of but little use. As a human food, the peas are used in various ways. The ripened grain is sometimes prepared for the table in much the same way that we prepare our Canadian peas for culinary purposes. It is also sometimes roasted and used as a substitute for coffee.

The average results from growing Egyptian peas in the Experimental Department show that there was a yield of one ton of straw, and of 35.6 bushels of grain per acre, and that the grain weighed a little over 62 pounds per measured bushel. It will, therefore, be seen that the Egyptian pea is a large yielder of grain. The crop is usually slow in maturing, requiring about two weeks longer to ripen than the ordinary field peas. As the plants are usually short in growth, the Egyptian peas are suitable only for very rich soil. As was the case with nearly all the leguminous crops, the Egyptian peas were a partial failure in 1902, owing to the unusual amount of cold, wet weather.

The Egyptian peas were distributed throughout Ontario for co-operative experiments for four years. Of 180 successfully conducted experiments, the average annual yield of grain was 21.1 bushels per acre, from which we infer that the Egyptian peas are not suitable for the average soil of the Province.

Cow Peas.

Nearly all the varieties of Cow Peas (*Vigna sinensis*) require such a long season of growth that they are suited only to the warm climate of the south. A few of the earlier kinds have been grown in the northern States, and have been tested at our Experiment Station at Guelph. We have not

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as yet, however, found a variety upon which we can depend to produce ripened grain, as our season is short, and it is only in exceptional years that even the earliest varieties of Cow Peas will mature their grain.

Lupines.

Lupines have been grown more or less for several years, with varying results. In 1902, three varieties were planted, viz., the White, the Yellow, and the Blue. The Yellow and the Blue varieties produced very poor crops; but the White gave a yield of 17.2 bushels of grain, and 1.6 tons of straw per acre. This result is much higher than we have usually obtained from Lupines in past years. As a rule, the crop does not give very satisfactory results.

Vetches for Seed.

As Hairy Vetches have been doing so well as a fodder crop, and as the seed is very expensive, it is desirable to glean information regarding the possibility of producing seed of the Hairy Vetch in Ontario. In growing both the Hairy vetches and the Common vetches for the past three years, the results show rather the best yields from the Hairy vetches in 1900 given rather better results than spring seeding with the Hairy vetches for seed production. The average yield of seed produced by the Hairy vetches and in 1901, and from the Common vetches in 1902. Autumn seeding has has been a little over 7 bushels per acre. This is not a very large yield of seed, but when it is realized that the seed has been selling at from $5 to $7 per bushel, the return is large, even from the amount of crop which was obtained.

Lentils.

We have grown Lentils in our experimental plots for about five years, and find that the plants usually grow to a height of about 12 inches. The crop of green fodder produced is usually small, and the plants seldom ripen their seed. In 1902, the yield of seed per acre was only 125 pounds, or a little over 2 bushels. The past results from growing Lentils at the College indicate that the crop is not likely to give satisfaction in Ontario.

Horse Beans.

Several varieties of Horse Beans have been tested in our trial grounds within the past twelve years. In most seasons, however, the weather is so hot and dry that the crop turns black and dies. It has been only in exceptional years that this crop has been successful. In 1902, the rains were so frequent and the weather so cool that the Horse Beans did unusually well, the yield of grain being 29 bushels per acre, which is the greatest yield that we have ever obtained in any season since our experiments with this crop were started. As a rule, however, the Horse Beans have been a failure in the experimental plots at Guelph.

Varieties of Flax.

Two varieties of flax have been grown for six years, one for five years and one for two years. The East India White variety of flax, which was sown in 1901 for the first time, and was sown again in the spring of 1902,

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has given very poor results. It is a very early variety, with short straw, and large(light-colored seeds. Its partial failure in 1901, and total failure in 1902, may be partly accounted for by the peculiar seasons. We intend to give it another trial next year. The results of the three varieties of flax successfully tested in 1902 are as follows : Manitoba, 16.8 bus.; Common, 15.7 bus.; and Russian, 10.5 bushels of seed per acre. In the average of the number of years that these varieties have been grown, we have obtained the following yields : Manitoba, 13 bus.; Common, 11.4 bus.; and Russian, 10.8 bushels per acre.

Varieties of Field Beans.

Although upwards of thirty varieties of field beans have been grown in our experimental grounds in some of the years past, the number for 1902 was limited to fifteen varieties. These were among the best kinds, as shown by the results of the previous experiments. The highest yields were produced by the Zealand Haricots, 26.1 bus.; White Wonder, 26 bus.; Medium or Navy, 25.3 bus.; Buckbee's Electric Tree, 25 bus.; and Pearce's Improved Tree, and Schofield Pea, each 24.8 bushels per acre. In weight per measured bushel, the results were quite high in 1902, the Buckbee's Electric Tree and the Burlinghame Medium each going upwards of 65 pounds. The majority of the varieties produced grain which weighed more than 64 pounds per measured bushel, and only three of the varieties produced grain which weighed less than 60 pounds per measured bushel.

In the average results of experiments conducted for six years, the following varieties produced the greatest yields per acre: White Wonder, 23.6 bus.; Day's Improved Leafless, 23.3 bus.; Medium or Navy, 23 bus.; Pearce's Improved Tree, 22.6 bus.; and Schofield's Pea, 22.5 bushels per acre.

Soy Beans.

The Soy bean (*Glycine hispida*) also known under the names of Soja Bean, Coffee Bean, Idaho Pea, etc., has been cultivated in Japan and China for a great length of time. The Soy bean is an annual legume, and the plants have an upright growth, and are almost completely covered with short hairs. The seed is generally sown at the rate of about one-half bushel per acre, in drills from two to three feet apart, which are cultivated in a manner similar to that of our Canadian beans. The crop is used for green fodder, or is allowed to ripen for the production of grain, which is exceedingly rich, and, when ground into meal, is considered about as valuable as cotton seed meal for stock feeding.

About twenty years ago, the Kansas Experiment Station imported from Japan fifteen varieties of Soy beans, carefully tested them at the Experiment Station grounds, and found that five of the varieties gave good results. About ten years ago, seed of these five varieties was grown in our own experimental plots.

Eight varieties of Soy beans have been imported and grown in our Experimental Department. Some of the varieties proved to be entirely unsuited for Ontario, owing to the long season required to reach maturity. The Early Yellow variety, however, has given good results as a grain producer, and the Medium Green variety for the production of green fodder. In the average results from growing the Early Yellow Soy beans for a period of seven years, 17 bushels of seed per acre have been obtained. In

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the production of green fodder, the Early Yellow variety produced an average of 8 and the Medium Green variety an average of 9.3 tons per acre for the same length of time.

The Early Yellow Soy beans were distributed over Ontario last year for co-operative experiments, and the average yield of grain produced on thirteen Ontario farms was 21.4 bushels.

We believe it would be a decided advantage to Ontario farmers to grow Early Yelow Soy beans more generaly for the production of grain for feeding purposes, and Medium Green Soy beans for putting into the silo with corn.

Varieties of Potatoes.

One hundred and twenty-four varieties of potatoes were grown in the experimental grounds in 1902. A number of these varieties had been previously grown at the College, while others were grown for the first time from seed imported from England, Ireland, and the United States. Each of the following twelve varieties produced upwards of 300 bushels of potatoes per acre in 1902 : Empire State, 358 bus.; Molly Stark, 337 bus.; White Elephant, 331 bus.; Convoy, 326 bus.; Rural New Yorker No. 2, 325 bus.; The Daisy, 315 bus.; Rose's New Invincible, 310 bus.; Uncle Sam, 309 bus.; Salzer's Earliest, 307 bus.; New Queen, 305 bus.; and Carman No. 1, 301 bushels. There was a marked difference between the various kinds in regard to the percentage of marketable potatoes. Some of the varieties produced potatoes, nearly all of which were marketable, as, for instance, the following kinds produced crops of which upwards of 92 per cent. of the potatoes measured over one and a half inches in diameter: Empire State, 95 per cent.; English Bumpers, 95 per cent.; Holborn Abundance, 94 per cent.; Carman No. 2, 94 per cent.; Carman No. 1, 93 per cent.; Rural New Yorker No. 2, 93 per cent.; Adirondack, 93 per cent.; Early Fortune, 93 per cent.; White Pink Eye, 93 per cent. In comparison with these high percentages, we find that four varieties had less than 40 per cent. of their entire crop of a sufficient size for market use, viz.: Lady Finger, 27 per cent.; Gemmell's Seedling, 30 per cent.; New Main Crop, 38 per cent.; and Tremendous, 39 per cent. Owing to the many rains, it was necessary to spray the potatoes with Paris green four times for the destruction of the potato bettle. Bordeaux mixture used with the Paris green on two occasions in order to prevnt the potato rot. There was, therefore, only a small amount of rot in the potatoes grown in the experimental department this year, which was quite different from the experience of potato growers in many parts of Ontario, who did not spray their potatoes with Bordeaux mixture in the summer of 1902.

In the average results of twenty-one varieties grown for nine years in succession, the following produced the greatest yields per acre : Empire State, 244 bus.; Convoy, 242 bus.; Rose's New Invincible, 241 bus.; Rural New Yorker No. 2, 234 bus.; and American Wonder and White Elephant each 232 bushels per acre.

For two years, about two hundred varieties of potatoes were carefully tested for table quality. The Empire State was found to be one of the best varieties for table use, as well as for producing an abundant crop.

Six rows of each of ten very early varieties of potatoes were planted in the spring of 1902. Two rows of each variety were dug and tested at the end of nine weeks, two other rows at the end of twelve weeks, and the two remaining rows at the end of fifteen

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weeks after planting. In this experiment, which was conducted in duplicate, the following varieties produced the largest average yields of potatoes per acre at nine weeks after planting : Early Fortune, Early Andes, Stray Beauty, Six Weeks, Early Dominion, and Early Dawn; at the end of twelve weeks, the greatest average yields were produced by the Early Andes, Early Dawn, Early Dominion, Early Fortune, and Stray Beauty. At the end of the third and last digging, viz., at the end of fifteen weeks after the potatoes were planted, the varieties which gave the greatest average yields per acre were the Early Andes, Stray Beauty, Early Dominion, Howe's Premium, and Early Fortune.

Selection of Seed Potatoes.

For eight years in succession, an experiment has been conducted in planting whole potatoes of different sizes, the selections each year being made from the crop produced the year previous from a similar selection. The average results from a duplicate experiment conducted in 1902, which was the eighth year after the commencement of the experiment, are as follows: Large whole potatoes, 199 bus.; Medium sized whole potatoes, 173 bus.; Small whole marketable potatoes, 116 bus.; and very small whole unmarketable potatoes, 99 bushels per acre.

As the result of this and other experiments, we find that large potatoes, or large pieces of potatoes, produced greater yields than either small potatoes or small pieces. It has been found that large potatoes cut into pieces of about two ounces in weight give satisfactory results, when the amount of seed used, and the yield of potatoes produced, are both taken into account.

Planting One, Two and Four Pieces of Potatoes in Each Hill.

As the result of an experiment conducted for four years in succession in planting one, two, and four pieces of potatoes per hill, and using the same weight of seed in every instance, it has been found that larger yields and better results have been obtained where only one piece was planted in each place. The average results for the four years, which are very suggestive, are as follows : One piece in each hill, 221 bus.; two pieces in each hill, 202 bus.; and four pieces in each hill, 182 bushels per acre. The cutting of a potato tends to increase the number of stems produced, and when from two to four small potato sets are planted in one place, there is a greater number of stems produced than when one large piece is used. The average percentage of marketable potatoes from each of the three methods is as follows : One piece per hill, 73 per cent.; two pieces per hill, 67 per cent.; and four pieces per hill, 62 per cent. It seems as though a few large, vigorous stems give better results in both yield and quality of potatoes than a large number of small, weakly stems, which are almost sure to grow when more than one piece is planted in each hill.

Influence of Coating Cut Potatoes with Lime, Plaster, etc.

For several years in succession, an experiment has been conducted by cutting potatoes and planting them with and without being sprinkled with plaster and with lime. In 1902, two varieties of potatoes were submitted to this treatment, and the experiment was conducted in duplicate with each variety. The results for 1902 are similar to those of former years, and show

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that those potato sets which have been sprinkled with plaster have given decidedly the best results, showing that the plaster had a marked influence in increasing the yield of potatoes in the experiments conducted at the College. In a similar experiment conducted throughout Ontario for three years, the results have shown a marked advantage from using plaster liberally in coating the potato sets immediately after they are cut.

Length of Time to Cut Potatoes Before Planting.

As a result of extensive experiments conducted at the College and throughout Ontario, it is found that under average conditions, it is decidedly better to plant potatoes immediately after they are cut, rather than to hold them four or five days before planting. As the result of experiments conducted for a period of eight years, we have obtained an average of 8 bushels per acre more from immediate planting than from the other method. The average percentage of marketable potatoes was also larger from immediate as compared with the delayed planting.

Potatoes Grown with Farmyard and with Poultry Manure.

An experiment was conducted in the experimental grounds in 1902 for the first time, to test the comparative values of ordinary farmyard manure and poultry manure for the production of potatoes. The experiment was conducted in duplicate. The following average yields of potatoes pere acre were obtained : Unmanured, 105 bushels; 5 tons of barnyard manure per acre, 144 bushels; 1 ton of poultry manure per acre, 125 bushels; and 2 tons of poultry manure per acre, 158 bushels.

Treatment of Potatoes to Destroy the Scab.

The scabby potatoes were immersed in a solution of corrosive sublimate for one and one-half hours, after which they were spread out to dry. They were then cut and planted in the usual way. The corrosive sublimate solution was made by dissolving corrosive sublimate in hot water in the proportion of two and one-quarter ounces of the former to two gallons of the latter. The solution was allowed to stand twelve hours, after which it was diluted with thirteen gallons of water. As the corrosive sublimate is very poisonous, the material itself should be looked after very carefully, and no potatoes which have been treated should be left unplanted.

Although there was a little scab on the potatoes produced from the seed which had been treated from the corrosive sublimate, the amount was only about two-fifths as much as that found on the potatoes which were untreated.

Different Methods of Treatment to Kill the Potato Beetle.

An experiment has been carried on in our trial grounds for seven years in succession by using different methods of treatment for destroying the potato beetle. The treatments used in all of these years have been Paris Green with water, Paris Green with plaster, and a preparation known as Potato Bug finish. These were used from two to four times each season. As a basis of comparison, one plot in every test was allowed to remain untreated. The average results of the experiments for the seven years go to show that the potatoes which were not treated produced an annual yield

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of 75 bushels per acre; those treated with Potato Bug Finish, 119 bushels; those treated with Paris Green and plaster, 128 bushels; and those treated with Paris green and water, 133 bushels per acre. In five out of the seven years, the Paris green and water gave the highest yield per acre, and in the other two years the Paris geen and plaster gave a larger yield of potatoes than either of the other methods of treatment. In no instance did the potatoes which we treated with the Potato Bug Finish give so large a yield of tubers per acre as those treated with the Paris green in solution. During the five years from 1896 to 1900, the Potato Bug Finish gave fairly good results, but during the past two years the results from this preparation have been quite unsatisfactory.

In 1902, six lots, of each of two varieties of potatoes, were carefully selected and planted on twelve separate plots. After the potatoes had made sufficient growth, and the potato beetles (bugs) had made their appearance, five plots of each variety were treated in different ways to destroy the beetles, and one lot of each variety was left untreated as a basis of comparison. The five treatments were as follows : (1) Paris green and water, using one pound of Paris green in 96 gallons of water per acre; (2) Paris green with plaster, using one pound of Paris green in 38 pounds of plaster per acre. This mixture was applied to the potatoes in the dry condition; (3) Potato Bug Finish, which was applied dry at the rate of 20 pounds per acre; (4) Bug Death and water, using 32 pounds of Bug Death mixed in 96 gallons of water per acre; (5) Bug Death, used in the same proportion as in No. 4, but in the dry condition; and (6) untreated. Three applications were made with each treatment. In the autumn, the potatoes from each of the twelve plots were dug and weighed. The following are the average results in yield of potatoes per acre: (1) Paris green and water, 124 bus.; (2) Paris green with plaster, 123 bus.; (3) Potato Bug Finish, dry, 107 bus.; (4) Bug Death and water, 163 bus.; (5) Bug Death, dry, 169 bus.; and (6) Untreated, 68 bushels. The results of the different treatments were very similar for the two varieties of potatoes. The Bug Death is manufactured at Saint Stephen, N.B., and has recently been introduced into Ontario. 1902 was the first year that it was tested in our trial plots at the Agricultural College. It has certainly made an excellent record this season. The potato tops on which the Bug Death was applied were more vigorous in growth and greener in appearance throughout the season than those on which the other applications were made. The Bug Death was also very effectual in killing the beetles. The usual prices of these insectides when bought in quantity are about as follows : Pairs green, 20 cents per pound; Bug Death, 8 cents per pound; and Potato Bug Finish, 1 2-3 cents per pound. The cost, therefore, for the material used in the experiment conducted in 1902 was about as follows : Paris green, 60 cents per acre; Bug Death, $7.65 per acre; and Potato Bug Finish $1.00 per acre.

Varieties of Sugar Beets.

Sugar beets have been grown in Ontario to a limited extent for several years as food for farm stock. More recently, however, a great deal of interest was centred in the production of beets for the manufacture of sugar. Experiments have been carried on in the experimental department with different varieties of sugar beets for nine years. Some of these varieties were specially adapted to the production of sugar, and others to the production of food. In 1902, thirty varieties were carefully tested in the experimental department for production, and in the chemical department

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for quality. These varieties represented beets for both agricultural and manufacturing purposes. Twenty-one of the varieties had been grown in the experimental plots in previous years, and nine of the varieties were grown in 1902 for the first time. Most of the new varieties were freshly imported from Germany, as being specially adapted to the production of a very high percentage of sugar. In 1900, and again in 1901, the sugar beets were planted in rows 26 inches apart, and the plants were thinned to a distance of 7.9 inches apart in the rows. In 1902, however, all the varieties were planted in rows 21 inches apart, and a distance of 7 inches was left between the plants in the rows. The following table gives the yield per acre of the different varieties which were grown in 1900, 1901, and 1902:

Varieties.	Yield of roots per acre.			
	1900. Tons.	1901. Tons.	1902. Tons.	Average Tons.
1. Red Top	24.25	19.63	26.81	23.56
2. New Danish Improved	19.10	18.60	27.88	21.86
3. White Silesian	21.45	18.15	25.94	21.85
4. Red Skinned	21.55	20 60	22.38	21.51
5. Royal Giant	14.95	19.29	29.63	21.29
6. Green Top White	18.35	18.91	26.56	21.27
7. White French	17.35	14.39	29.06	20.27
8. Lane's Improved	20.45	16.28	22.75	19.83
9. Champion	19.25	17.18	22.38	19 60
10. Carter's Nursery	13.35	14.93	29.38	19.22
11. Giant Red Half Sugar	14.50	17.67	25.38	19.18
12. Giant White Half Sugar	14.05	17.22	25.38	18.88
13. Kleinwanzlebener	14.38	16.81	23.06	18.08
14. French Yellow	13.15	15.14	23.19	17.16
15. Queen of the Danes	11.65	12.63	26.00	16 76
16. Pitzschcke's Elite	14.85	14.61	20 63	16.70
17. Imperial Grey Top	11.85	15.87	21.81	16.51
18. Improved Imperial	14.00	14.22	21.31	16.51
19. Jersey	13.70	14.63	20.69	16.34
20. Mangel Sugar Beet		13.01	20.50	16.76
21. Vilmorin's French Sugar		13.22	19.44	16.33
22. Ideal (Keirche)			30.13	30.13
23. Tankard Cream			28.56	28.56
24. Kleinwanzlebener (Mette)			21.50	21.50
25. Jaensch's Victrix			21.44	21.44
26. Rubensamen (Rimpau)			21 06	21.06
27. Dieckman No. 3			20.44	20.44
28. C. Vorstadt Beet Seed			20.44	20.44
29. Dieckman No. 1			19 63	19.63
30. Dieckman No. 2			19.13	19.13

It will be seen that the Kleinwanzlebener, which is the variety principally used for the production of beets for the four factories now manufacturing sugar in Ontario, yielded 14.4 tons per acre in 1900; 16.8 tons per acre in 1901, and 23.1 tons per acre in 1902, making an average of a little over 18 tons per acre for the three years. Vareities such as the Red Top and the New Danish Improved, which produce heavy crops per acre, contain a much less percentage of sugar, and are not suitable for factory purposes. The last nine varieties on the list were all grown from fresh seed, nearly all of which was imported directly from Germany in the spring of the present year. They were obtained from different sugar beet breeders in Germany, who have made a specialty of selecting beets for many years in order to obtain a high percentage of sugar. For the results of the chemical analysis of these beets, the reader is referred to the report of the Chemical department, written by Prof. Harcourt in a previous portion of this volume.

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Eight varieties of sugar beets have now been grown in the experimental department for nine years in succession. The following are the average yields in tons per acre for the nine years : Red Top, 19.7; White Silesian. 19.3; Lane's Improved, 19.3; Champion, 18.6; White French, 17.5; Red Skinned, 16.4; Kleinwanzlebener, 16.3; and Improved Imperial, 14.3. Three other varieties, which have been grown for seven years in succession, have produced the following average yields per acre: New Danish Improved, 21 tons; Jersey, 18.5 tons; and French Yellow, 17.8 tons.

Planting Sugar Beets at Different Distances Between the Drills.

An interesting experiment was conducted on our trial grounds in 1902 for the first time by planting sugar beets in rows nine different distances apart. The variety of sugar beets known as the Kleinwanzlebener was used. There were seven rows in each plot, each row being four rods in length. The experiment was conducted in duplicate. The following table gives the average results of the duplicate tests :

No.	Distances.	Average of two tests.	
		Average weight per root.	Yield of roots per acre.
		lbs.	tons.
1	12 inches apart	.72	26.02
2	14 " "	.78	23.92
3	16 " "	.82	23.41
4	18 " "	.93	22.60
5	20 " "	1.02	22.46
6	22 " "	1.05	21.52
7	24 " "	1.10	20.38
8	26 " "	1.14	20.00
9	28 " "	1.18	18.82

From the results here presented, it will be seen that, as the distance between the rows increased, there was an increase in the average size of the roots and a decrease in the yield of roots per acre. The roots which were grown in rows 18 inches apart, which is the usual distance to grow sugar beets for sugar production, yielded 22.6 tons per acre in comparison with 20.4 tons from rows 28 inches apart, and 18.8 tons from rows 28 inches apart. Samples from the various parts of this experiment were taken by Prof. Harcourt for analysis from the standpoint of sugar production. For the results of these analyses, the reader is referred to the report of the Chemical department in this volume.

Varieties of Field Roots.

Extensive experiments have been conducted in past years in testing different varieties of the various classes of field roots. The results of these experiments have appeared in the College reports from time to time. The following are among the leading varieties in each class of roots : Swede Turnips,—Sutton's Magnum Bonum, Improved Purple Top Yellow, Buckbee's Giant, Hartley's Bronze Top, and Kangaroo; Fall Turnips,—Red Top, White Globe, Cow Horn, and Jersey Navet; Mangels,—Yellow Leviathan, Sutton's Mammoth Long Red, Evans' Improved Mammoth Sawlog, and Steele's Long Red Selected; Carrots,—Mastadon White Intermediate, Mammoth Intermediate, Smooth White, and Pearce's Improved Half Long White; Parsnips,—New Ideal, Hollow Crown, and Improved Half Long.

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Selection of Seed of Field Roots.

A considerable amount of attention has been devoted to experiments in different selections of root seed within the past few years. For this experiment, good commercial seed of the best varieties was obtained in the spring of each year. The seed was then graded, first, by the use of sieves, and then by hand picking, until distinct selections were secured. Nothing but sound seed, however, was used in each instance. The experiment included sugar beets, mangels, swede turnips, fall turnips, and carrots, and was repeated for three, four, and five years in succession. But few people even imagine the great importance there is in sowing seed of the best quality. A large, well-developed seed will almost always produce a much better plant than a smaller seed of the same variety. The results of these experiments show the great importance of using special care in the selection of the seed of our common field roots.

Crops.	Number of years of Experiment.	Average yields of roots per acre.		
		Large seed.	Medium sized seed.	Small sized seed.
		tons.	tons.	tons.
Sugar Beets	4	23.67	22.52	15.69
Mangels	5	33.19	29.62	21.52
Swede Turnips	4	13.97	12.39	5.66
Fall Turnips	3	22.79	19.45	11.97
Carrots	5	24.47	22.23	16.23
Average		23.62	21.24	14.21

Planting Whole and Broken Seed of Mangels and Sugar Beets.

Enquiries were made in the spring of 1902 as to the practicability and value of breaking the husks of both mangel and sugar beet seed before sowing. These enquiries suggested the advisability of our conducting some experiments along this line at once. We, therefore, conducted an experiment by taking both mangel and sugar beet seed and breaking the husk in various ways. It was a very difficult matter, however, to remove the husk without injuring the seed. Although we were very careful in the experiment, we were unable to make a satisfactory separation of the husk from the seed; and in every test the whole seed produced a greater yield of roots than a similar quantity of broken seed.

Sprinkling Turnip Seed With Coal Oil to Prevent Injury by the Turnip Fly.

By request, an experiment was conducted in 1902 by thoroughly mixing a large teaspoonful of coal oil with a pound of turnip seed just before sowing. The treatment caused no injury whatever to the seed, and appeared to secure a slightly better stand of plants, which gave a small increase in yield of roots over the untreated seed. This experiment will likely be repeated in future years.

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Planting Seed of Field Roots at Different Depths.

In 1902, the seed of both sugar beets and carrots was planted at different depths in the soil. The experiment was conducted in duplicate with each variety. The following gives the average number of tons produced by each class of roots at each of the various depths to which the seeds were planted : 1-2 inch deep,—Sugar Beets 18.8 tons, Carrots 12.7 tons ; 1 inch deep,—Sugar Beets, 19.8 tons, Carrots, 12.4 tons ; 1 1-2 inches deep,—Sugar Beets, 17.1 tons, Carrots, 7.6 tons; 2 inches deep,—Sugar Beets, 18.3 tons; Carrots, 5.9 tons; 3 inches deep,—Sugar Beets, 18.3 tons, Carrots, 5.9 tons ; 3 inches deep,—Sugar Beets, 13.8 tons, Carrots, 3.1 tons; 4 inches deep,—Sugar beets, 7.6 tons, Carrots, 1.5 tons. Similar experiments were conducted with sugar beets for three years, and with carrots two years previous to 1902. The average results show that the seed which was planted only 1-2 inch deep gave the best results, with both classes of roots.

Flat and Ridged Cultivation for Sugar Beets.

Four plots were sown with sugar beet seed, two of them being left on the level and the other two being ridged before the seeding took place. The object was to ascertain whether or not as good results could be obtained from growing sugar beets on land which remained level as from land which was made into ridges by means of a double mould-board plow. The variety of sugar beet used for this test was the Kleinwanzlebener, which is the one principally grown in Ontario for the production of sugar. The rows were made 21 inches apart, and the plants were thinned to 7 inches apart in the rows. The experiment was conducted in duplicate, and the average of the two tests shows that 20.6 tons of roots were obtained from the level cultivation, and 19.8 tons from the ridged cultivation. It is, therefore, seen that the results from growing sugar beets in 1902 are best from level cultivation, so far as yield per acre is concerned. These results are very similar in this respect to the results of experiments conducted previously in growing other kinds of roots under the two methods of cultivation here described.

Fertilizers with Swede Turnips.

For four years in succession, an experiment was conducted in duplicate by applying fertilizers to the land on which swede turnips were grown. The fertilizers and the quantities used per acre of each were as follows : Nitrate of Soda, 160 pounds; Muriate of Potash, 160 pounds; Superphosphate, 320 pounds; and mixed fertilizer, 213 1-3 pounds. The mixed fertilizer was made by using one-third the quantity of each of the fertilizers used on the other plots. The muriate of potash and the superphosphate were applied at the time of seeding, but the nitrate of soda was not sown until the turnips were about two inches in height. The cost of the fertilizers, as used in this experiment, would amount to about $4.00 per acre. The following results give the average yield in tons per acre from the fertilizers applied in four separate years : Mixture, 16.7 tons; Superphosphate, 15.9 tons ; Nitrate of Soda, 15.3 tons; Muriate of Potash, 14.3 tons; and the unfertilized land, under similar conditions, gave 12.8 tons. It will, therefore, be seen that the mixed fertilizer increased the yield of turnips about 4 tons per acre at a cost of about $1.00 per ton for the fertilizer used.

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Experiments with Corn for the Production of Fodder or Silage.

Owing to the very cool weather and the unusually large amount of rainfall during the past summer, the results of the experiments in corn growing are in some respects different from those of previous years. The crops were very much later than usual in reaching maturity.

Varieties. One hundred and thirty-five varieties of corn were grown in the experimental department in 1902. Owing to the peculiar weather conditions, only about twenty of these varieties reached maturity in time for cutting in the autumn. The greatest total yields in 1902 were produced by the New Delaware Dent, 24 tons; and Pedrick Perfected Golden Beauty, 23.8 tons per acre. Those producing the largest yield of husked ears per acre in the past year were the Golden Leneway Dent, 4.3 tons; Snow White Dent, 4.3 tons; and Black Mexican Sweet Corn, 4.2 tons per acre.

Of all the varieties which have been grown for several years in succession, we find that the Mammoth Cuban and the Mastadon Dent are varieties which give excellent results on the warm soils of Southern Ontario, where many varieties of corn can be grown successfully; that the Wisconsin Earliest White Dent gives a good yield of total crop per acre, which is of excellent quality. This variety has produced the largest yield of ears per acre among all the varieties grown for six years in succession, and is well suited to the central part of Ontario, where the frosts are not too severe; and the three flint varieties,—Salzer's North Dakota, Compton's Early, and King Phillip,—and the one Dent variety, North Star Yellow Dent, have given good results and are well suited for the central and southern part of Ontario.

Different Depths of Planting. In an experiment which has been conducted for four years in planting corn, 1-2", 1", 1 1-2", 2", 3", and 4" in depth, the greatest average yields were obtained from planting 3 inches deep in 1899, and 2 inches deep in each of the years 1900, 1901, and 1902. The following gives the average results in yield of corn per acre produced in the average of four years' tests from planting at six different depths, starting with the largest and finishing with the lowest yields: 2 inches, 13.2 tons; 1 1-2 inches and 3 inches, each, 11.8 tons; 1 inch, 11.7 tons; 1-2 inch, 10.6 tons; and 4 inches, 9.8 tons.

Methods of Cultivation. For the first time, an experiment was conducted in 1902 by cultivating corn in the four different methods here described. The North Star Yellow Dent variety of corn was used in the experiment, and the experiment was conducted in duplicate. Each test consisted of four plots. The average results of the two tests made are as follows: (1) Deep cultivation at first, gradually getting shallower as the season advanced, 23.9 tons per acre; (2) Shallow cultivation throughout the season, 23.6 tons per acre; (3) Deep cultivation throughout the season, 23.3 tons per acre; and (4) Shallow cultivation at first, gradually getting deeper as season advanced, 22.3 tons per acre. From these results it will be seen that in a season such as we had in 1902, corn which was cultivated deeply immediately after it was planted, and in which the cultivation was shallower as the season advanced, produced the greatest yield, while that which was cultivated shallow at first and deeper as the season passed by, produced the lowest yield. This experiment will likely be repeated in future years.

Varieties of Millet for Green Fodder.

Thirteen varieties of millet have been grown for the production of fodder for eight years. There has been a marked difference in the productive-

ness of the different varieties under experiment; as, for instance, the average yield of green crop per acre for eight years is 4.9 tons for the Red French and 6.1 tons for the White French varieties; while that for the Golden Wonder, Holy Terror, Gold Mine, Japanese Panicle, Japanese Barnyard, and Magic varieties, yielded 11.6, 11.4, 10.4, 10.3, and 10.3 tons per acre, respectively. The Japanese Common millet, which has been grown for seven years, has produced an average of 11.5 tons of green crop per acre. The three heaviest yields in 1902 were the following : Japanese Common, 10.9 tons per acre, and Japanese Barnyard and Holy Terror Gold Mine, each 9.7 tons per acre.

Varieties of Rape.

The Dwarf Essex and the Dwarf Victoria varieties of rape have each been tested under similar conditions in the experimental grounds for eight years. The average results show that the Dwarf Essex variety has produced 23.4 tons, and the Dwarf Victoria variety, 21.8 tons of green crop per acre. The Buckbee's Wonderful Bonanza rape was grown here for the first time in 1902, and it gave satisfactory results.

Varieties of Sorghum for Fodder.

Sixteen varieties of sorghum have been tested in the experimental grounds for three years. These included different varieties of sugar cane, broom corn, Kaffir corn, etc. As there is much interest being taken in the cultivation of sorghum as a stock food in some parts of Ontario, the average results of each of the sixteen varieties are here presented :

Varieties.	Average for 3 years.		
	Per cent. of leaf to stem.	Yield of heads per acre.	Yield of green fodder per acre.
		Lbs.	Tons.
1. Early Minnesota Sugar Cane	16	1,353	17.3
2. Orange Sugar Cane	34	273	16.8
3. Fodder Cane	25	1,553	14.4
4. Early Amber Sugar Cane	19	987	13.7
5. Kansas Orange Sugar Cane	32	240	13.6
6. Black Rice Corn	41	687	13.3
7. White Kaffir Corn	35	1,373	12.9
8. Red Kaffir Corn	44	563	11.2
9. California Golden Broom Corn	26	2,387	9.9
10. Yellow Millo Maize	34	860	8.8
11. Improved Evergreen Broom Corn	23	2,073	8.5
12. Early Japanese Broom Corn	22	2,247	8.5
13. Brown Dhoura Corn	38	1,667	7.6
14. Dwarf Broom Corn	35	1,633	7.1
15. White Millo Maize	43	60	7.1
16. Jerusalem Corn	38	847	5.9

The greatest yields in 1902 were produced by the Early Minnesota Sugar Cane, 19.1 tons; Fodder Cane, 16.7 tons; Early Amber Sugar Cane, 16.6 tons; and Rennie's Improved Amber Cane, 13.7 tons of green crop per acre.

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Some Leguminous Crops for Green Fodder.

For two years in succession, experiments have been conducted with sixteen varieties of leguminous crops for the production of green fodder. Some of these varieties have been tested for a very much longer period of time; but, for the sake of comparison, the results here presented are for the two years in which all of the varieties were grown under uniform conditions:

Varieties.	Average for 2 years.	
	Length of plants.	Tons of green crop per acre.
	Ins.	Tons.
1. Hairy Vetches	33	13.90
2. Medium Green Soy Beans	29	11.68
3. Horse Beans	36	10.35
4. Common Vetches	.....	9.70
5. Grass Peas	39	8.55
6. Early Yellow Soy Beans	25	8.15
7. Wonderful Cow Peas	19	8.04
8. Prussian Blue Peas	48	7.93
9. Extra Early Blackeye Cow Peas	18	7.90
10. Taylor Cow Peas	15	7.60
11. New Era Cow Peas	17	7.03
12. American Coffee Berry	22	6.68
13. Whip-poor-will Cow Peas	16	6.53
14. Warren's Extra Early Cow Peas	17	5.50
15. Velvet Beans	14	2.97
16. Extra Early Dwarf Soy Beans	20	2.53

It will be seen that the Hairy Vetches have given an average of 4.2 tons per acre more than the Common Vetches in the average of two years' experiments. Further, these varieties have been tested one with the other for the past six years, and the average results are: Hairy vetches, 10.5, and the Common Vetches, 6 tons of green crop per acre. The Medium Green Soy Beans, which stand second on the list, are an exceptionally fine variety, and we believe will be a valuable crop to grow for fodder, either for feeding in the autumn or for mixing with corn for the silo in order to increase the quality of the silage. The Horse Beans, which stand third on the list, have done much better than usual during the last two years. The season of 1902 was specially well adapted to the growth of Horse Beans. In most seaons, this crop has resulted in a total failure. Grass Peas gave much better results in 1902 for green fodder than for the production of grain. Owing to the frequent rains, the crop continued green for a long time, and many who were growing Grass Peas with the object of securing a grain crop, were compelled to cut and dry them for hay. The Early Yellow Soy Beans are not so good a kind for the production of green fodder as the Medium Green variety. The first named variety, however, is earlier in maturing, and in most sections of Ontario will likely be a better variety than the Medium Green for the production of grain. Most of the varieties of Cow Peas come towards the end of the list in comparative yields of green fodder.

Annual Crop of Pasture.

As a result of many enquiries about the value of spring crops for the production of pasture, an experiment was started in the spring of 1900, to

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find out which annual crops were likely to give the best results when used for pasture. For this purpose we have tested eighteen crops for three years in succession. In each of the three years the crops were sown in three separate sets, there being eighteen plots in each set, thus making in all a total of fifty-four plots each season. All of the plots were sown on the same day, and under similar conditions each year. The main object of the experiment was to find out the relative value of the different crops for pasture, both early in the season and throughout the summer. The seed was all sown on the 5th of May in 1900, on the 6th of May in 1901, and on the 9th of May in 1902. The three sets were handled each year as follows :

Set 1. The crops on all the plots in Set 1 were cut at the end of six, nine, twelve, fifteen, and eighteen weeks after the seed was sown, thus making five cuttings for each crop. Each cutting was weighed in the green state, and also after it was dried in the form of hay.

Set 2. Each crop was cut when it was thought to contain the greatest bulk of the best quality of green fodder. In order to ascertain the after-growth, another cutting was also made from each plot later in the season.

Set 3. A hurdle fence was placed around the set of eighteen plots, and cattle were turned on the plots daily until the pasture was all eaten. The first pasturing took place in the latter part of June and the early part of July. Careful notes were taken of the amount eaten of each crop each day. After the crops were pastured the first time, they were allowed to remain undisturbed until the autumn, when the cattle were again turned on, and the second growth was eaten off.

The table here presented gives the average results for the three years in yield of green crop per acre produced by each variety on the five dates of cutting, as determined in Set 1. It also gives the total amount of green material produced from the five cuttings of each crop:

Crops.	Tons of green crop per acre, at each cutting—Average of three years.					Total number of tons per acre in five cuttings.
	1st cutting 6 weeks after seeding.	2nd cutting, 9 weeks after seeding.	3rd cutting, 12 weeks after seeding.	4th cutting 15 weeks after seeding.	5th cutting, 18 weeks after seeding.	
	tons.	tons.	tons.	tons.	tons.	tons.
1. Hairy Vetches	.99	3.68	1.63	1.57	.79	8.66
3. Crimson Clover	.01	2.32	2.10	1.02	2.03	7.47
3. Siberian Oats	3.35	1.78	1.59	.33	.27	7.32
4. Early Amber Sugar Cane	.08	1.70	3.15	1.03	1.00	6.96
5. Common Red Clover	.00	1.55	2.34	1.45	1.60	6.94
6. Common Vetches	1.21	2.29	1.38	.64	.80	6.32
7. Spring Rye	5.08	.65	.40	.00	.00	6.13
8. Dwarf Essex Rape	.40	2.77	1.45	.62	.73	5.97
9. Hungarian Grass	1.09	1.98	1.60	.83	.33	5.83
10. Mandscheuri Barley	3.48	1.02	.67	.08	.15	5.40
11. Grass Peas	1.49	2.22	.92	.22	.08	4.93
12. Kaffir Corn	.01	1.88	1.59	.71	.69	4.88
13. Compton's Early Corn	.40	2.38	1.23	.49	.01	4.51
14. Wild Goose Spring Wheat	2.17	.93	1.12	.11	.07	4.40
15. Prussian Blue Peas	2.14	1.19	.28	.00	.00	3.61
16. Early Yellow Soy Beans	.53	1.23	.58	.34	.28	2.96
17. Cow Peas	.12	1.80	.27	.21	.07	2.47

The results of these experiments up to the present time seem to show the advantage of growing a mixture of annual crops, rather than growing the crops separately for pasture. The results indicate that the following combinations should prove serviceable for the production of pasture of good

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quality throughout the season, viz., (1) Oats, Hairy Vetches, and Early Amber Sugar Cane; (2) Spring Rye, Hairy Vetches, and Hungarian Grass; and (3) Barley, Crimson Clover, and Early Amber Sugar Cane.

Grasses and Clovers.

Some experimental work has been done at the College with grasses and clovers each year since the Experimental department was started in 1876. Most of the results of these experiments have been reported from time to time. During the past few years, we have begun a number of interesting and important experiments which are now in progress, and which will be reported more fully in future publications. Only a few references to some of them are made in this report.

Varieties of Grasses and Clovers. Quite extensive experiments have been conducted with different varieties of grasses and clovers for green fodder, for hay, for pasture, and for seed; but it is very difficult to give a summary of the results, since the different varieties vary so much in their characteristics, as, for instance, the Crimson Clover is an annual, the Common Clover is a biennial, and the Lucerne or Alfalfa is a perennial. Short reports were given of this work in the College Report for 1901; and as most of the experiments were continued for several years, we hope to be able to present the results in a more detailed form on some future occasion.

Mixtures of Grasses and Clovers for Hay. An experiment was conducted with twenty-one mixtures of grasses and clovers from 1897 to 1899, and was repeated from 1898 to 1900. As the average results of these experiments, we find that Tall Oat Grass and Lucerne gave 3.2 tons of hay per acre; Tall Oat Grass, Orchard Grass, Mammoth Red Clover, and Lucerne gave 3.1 tons, and the Timothy and Lucerne 3.1 tons. Nearly all of the others gave a yield of between 2 and 3 tons per acre, except some of the mixtures containing Orchard Grass, which gave slightly below 2 tons per acre. The Orchard Grass was considerably killed during the second winter. It will be observed that the Lucerne was one of the varieties in each of the three mixtures which gave the largest yields of hay per acre. This experiment is now being conducted for the third time. The seeds were sown with a grain crop in the spring of 1901, and each plot of hay was carefully harvested and weighed this season. Owing, no doubt, to the peculiar weather conditions of the past summer, the results are somewhat different from those of previous experiments. The greatest yields in 1902 were produced by Timothy with Mammoth Red Clover; Tall Fescue with Mammoth Red Clover; Tall Oat Grass with Mammoth red Clover; and Orchard Grass with Mammoth Red Clover. It will be seen that the results of those mixtures in which Mammoth Red Clover was included were very high this season. These plots will all be cropped again in 1903.

Mixture of Grasses and Clovers for Permanent Pasture. As the result of several years' experiments, the following mixtures, with amounts of seed used of each variety, has given the best results as a permanent crop of grasses and clovers: Orchard Grass, 4 lbs.; Meadow Fescue, 4 lbs.; Tall Oat, 3 lbs.; Timothy, 2 lbs.; Meadow Foxtail, 2 lbs.; Lucerne, 5 lbs.; Alsike Clover, 2 lbs.; White Clover, 1 lb.; and Trefoil, 1 lb,—making a total of 24 pounds of the mixture of grass and clover seed per acre.

Grain Crops Grown on Grass Sod and on Clover Sod. In 1899, in 1900, and in 1902, experiments were conducted by sowing grain on land which

had produced grass in one case and clover in the other. Both the grass and the clover crops were removed from the land, the stubble was plowed, and the grains were sown in order to ascertain the comparative value of the different sods for the production of grain. The grain sown for these experiments was a mixture of oats and barley in 1899, winter wheat in 1900,and barley in 1902. The average results of the experiments in number of pounds of grain per acre are as follows: Mixture of oats and barley from grass sod,1,078 and from clover sod, 2,256; of winter wheat from grass sod, 2,300, and from clover sod, 3,194; and of barley from grass sod, 1,022, and from clover sod, 1,451. Taking the average of the three years, we find that we obtained 1,467 pounds of grain per acre from the grass sod, and 2,300 pounds of grain per acre from the clover sod, thus making a difference of 833 pounds of grain per acre in favor of the clover sod.

Acknowledgments.

I wish to acknowledge the valuable services rendered during the past year by my foreman, Mr. A. E. Whiteside, in looking after the details of work of the department; by my assistant, Mr. W. J. Squirrell, in the office work; by Mr. J. Buchanan, B.S.A., in the work of plant breeding, and by Mr. L. S. Klinck, a senior student, in assisting with the farmers' excursions which came to the College in the month of June.

Conclusion.

I wish to thank both yourself and the Minister of Agriculture for the kindly support given me in the work of the Experimental Department during the past year. The department is now taxed to its utmost, and I ask for more help and for more money in order to make the experimental work in field agriculture of greater value to the Province. Acording to the reports of the Bureau of Industries, the farm crops which are now produced in Ontario have a market value of upwards of one hundred million dollars a year. I, therefore, feel justified in asking for good substantial support in the work of this important department.

Respectfully submitted,

C. A. Zavitz,

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PART XIV.

THE MANAGER OF THE POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College :

Sir,—I have the honor of presenting herewith the report of the Poultry Department for the year 1902.

A larger amount of experimental work than usual has been carried on this year, especially with the hatching of eggs during the months of January, and the fattening of chickens; but this work needs to be carried further before definite and reliable conclusions can be drawn.

Farmers in general are taking a more active interest in their poultry, as is manifested in the increased correspondence, and the special interest taken during their visits here from time to time.

The prices of poultry and eggs have been high this year; but the increase has not been any more than enough to balance the advance in the prices of grains. In fact, this has not been so good a year for the small poultry farmer as some other years, but it has been an excellent year for the farmer who keeps but a small flock, which pick up a large portion of their living in food that would otherwise go to waste.

From a financial standpoint, the past year has not been a very successful one in this department, owing largely to the fact that we had a number of unprofitable experiments, especially in rearing early chickens, and the fattening of fowls on an "all cooked" grain ration.

There was a good attendance at the Short Course in Poultry Raising during January. Some twenty-nine students took advantage of this course. This number is fully as many as we can accommodate, and give anything like the practical work that should be given. The large majority of the students expressed themselves as being well satisfied with the course, and they have had better success during the past season than heretofore.

Special lectures in the Short Course were given by L. H. Baldwin, Deer Park, Ont.; W. J. Bell, Angus, Ont.; and Newton Cosh, London, Ont.

The usual number of lectures were given to the regular College students, and to the Farm Dairy Class.

During the month of May, I visited a number of the leading poultry farmers in the States of New York, Massachusetts, and Rhode Island. I also visited the Experiment Station and Agricultural College at Kingston, Rhode Island.

The farmers in the sections visited raise more poultry and eggs than our farmers, and state that they find it much more profitable than any other branch of farming. It must be remembered, however, that they are very convenient to such large markets as Boston and New York, where very high prices are paid for gilt-edged products.

While visiting the poultry farms at Groton, N.Y., I was very much impressed with the large number of farmers who were making a specialty of producing eggs only, especially white eggs, to be sold in New York City.

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Practically every farmer, large and small, kept hens to lay only, and the one breed was Leghorns. They made no attempt to produce market chickens. As might be expected, we found incubators and brooders in general use.

In the part of Massachusetts that I visited, I found the poultrymen trying to produce brown eggs for the Boston market, and as many yellow-skinned broiler and roaster chickens as they could raise. In this locality, also, egg production was of importance, but raising chickens for the market seemed to be looked on with more favor. Here, as might be expected, Plymouth rocks and Wyandottes were much in evidence, and the Leghorn was looked upon as a fowl of no special value. Some farmers used a large number of incubators; others used both hens and machines; and a few used hens only.

I was much impressed with the Rhode Island poultry farmers. In the district through which I travelled, in the vicinity of Little Compton, nearly every farmer was a chicken man, kept from 500 to 1,500 laying hens, and raised from 1,000 to perhaps 8,000 chickens. Practically only one breed was seen, and that one was Rhode Island Reds. A few flocks of Brahmas were seen, as well as odd flocks of Rocks and Wyandottes. Here the farmers practically raised and hatched all their chickens with hens. The breed being a general purpose one, and the hatching being done in the natural season (the months of April, May and June), the incubator was not a necessity, and the farmers were well satisfied with the natural method; and well they should be if they all got as good hatches as the one I saw at Mr. Wm. Sissons's, where 70 hens were taken off with 700 chickens. The hens in this portion of the State are practically all housed on the colony plan, each house accommodating about 40 birds. There are seven or eight houses in a four acre field. A horse and a cart go the rounds daily for feeding, watering, and collecting the eggs. I was particularly interested in seeing whole grain in front of the hens continually, and the fine health and vigor of the flocks. The fowls here have practically free range the year round, which does away with many objections that we should find here, to keeping feed in front of birds continually.

The Rhode Island farmers raise geese extensively, some having from 300 to 500 goslings.

Corn is fed much more freely than it is in Ontario; in fact, as far as I could learn, it was used fully as much as wheat. All kinds of fowls were fed corn.

Hatching Eggs in January.

During the month of January, we set 1,546 eggs in the incubators. It has always been a problem to get well-fertilized eggs at this season of the year, and what eggs are fertilized have, as a general rule, very weak germs. The machines were filled primarily to give the Poultry School students practice in handling incubators; and secondly, to determine what results might be obtained from eggs at this season of the year.

The eggs were purchased in New York State, Amherst, N.S., London, Ont., Toronto, Ont., and Guelph, Ont., and some were laid by our own hens. The prices paid varied, according to the locality, from $4 per 100 to $10 per 100. As far as results were concerned, there was little difference where the eggs came from—very few chickens were hatched from any of them. From the 1,546 collected and set in January, 226, or a little of 14.6 per cent., of rather weakly chickens were hatched. It was practically im-

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possible to raise these chickens, and very few reached broiler size. As to the cause of the failure, I cannot speak; but I am of the opinion that the steady cold weather influenced the birds, making them rather inactive; and some of the eggs may have been chilled before reaching us. The weather being cold, we did not ventilate the incubator room so much as we would like; so there is a possibility that the chicks did not receive sufficient oxygen, or pure air, during the process of incubation.

Later Hatching.

We used both the incubators and the hens for hatching during April and May. The incubators hatched about as well as the hens; but in some cases where hens were set upon specially selected eggs from individual hens which had been mated for special purposes, we got rather better results than we did from the average sitting.

There is still much trouble with chickens dying in the shell during the period of incubation, but more particularly during the seventeenth and eighteenth days. This is attributed to many causes, one of which is a lack of evaporation of the egg contents, or too much evaporation. We weighed the eggs sent under several hens this season, and noted the loss in weight; and we also weighed the eggs set in some of the incubators. We have not yet collected sufficient data to warrant publication; but in one or two cases where the evaporation was practically the same under the hens and in the incubator, there were widely different results. We also found the indivdual hens varying greatly in the loss in weight of the eggs set; and yet they hatched practically the same percentage. We are greatly in need of experimental work along these lines; and I am asking for a special appropriation for that purpose.

The average hatch of both was about 50 per cent. Of course, some were much better; and the eggs from some pens were much better fertilized than from others. We had two pens of different breeds from which, for a time, we failed to hatch a chick. This was no doubt due to the sterility of the cock-bird, as in each case when the male was removed and a new one placed in the pen, the eggs hatched fairly well.

General Treatment of Breeding Stock.

During the past winter, our system of feeding was much the same as in previous years. Some whole grain was fed in the straw or litter early in the morning; roots were fed at noon; and a mash, or soft food, was given at night, with a little whole grain immediately afterwards. This method of feeding gave very good results.

We have aired our houses much more freely than in previous years, not a day passing but the doors have been opened for a time. Of course, in cold weather, the doors are closed much sooner than in mild weather. We open the house early in the morning and give it a good airing, and get the birds to work, which keeps them warm; and the fresh air does them good. We do not object to the water freezing a little. Some days we find it necessary to renew the water two or three times. It will not do to have the house so cold that the hens' combs will freeze, else egg production will cease. If there is danger of the male's comb freezing, he may be put into a barrel at night and covered with a sack. This treatment generally prevents the comb from being frosted. Our birds are much better in health when they are given plenty of fresh air, and the egg production is better than when the houses are closed and stuffy.

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The hens moulted very early last season, which made the summer egg production much short of what it usually is; but it should result in better returns this winter.

Layers.

We are working to produce an especially heavy laying strain of Barred Plymouth Rocks, and the other varieties we are breeding are being worked more or less along the same line. The particularly good layers are mated together, and their progeny kept for the next season's breeding. Our object is to get a good utility fowl, and one that will at the same time be no disgrace in a show pen. The work has been slow and rather disappointing at times, but it is gratifying to know that some progress is being made.

The Plymouth Rocks, Wyandottes, Orpingtons, and the Langshans laid best during the winter; and the Leghorns, Andalusians, and Minorcas did best in the summer.

Buff Orpingtons.

The Orpington is being boomed in Ontario as the ideal farmer's fowl. Its legs and skin are naturally white; and it is claimed by its supporters to have all the good qualities of the popular Plymouth Rocks and Wyandottes. Our experience with them during the past season, is that they are good winter layers, good sitters, and good mothers, and the chickens grow well and make good market birds.

To those who are breeding Orpingtons, I would say: Select with great care; do not try to sell every chicken for a fancy price simply because its legs are white. Preserve the short, cobby English type, and avoid the long-legged, long-backed, heavy weight sort that is in favor in some parts of America.

The desire of some Orpington strains to sit persistently during warm weather should be bred out.

Plymouth Rocks and Wyandottes.

The Plymouth Rocks and Wyandottes are well established in many parts of Ontario, and are giving general satisfaction. If the breeders of these varieties keep to the proper type, they are sure to remain popular. Newcomers may be as good, but they must be better in many ways in order to supplant the old-time favorites.

Ducks.

This sason, we set a large number of duck eggs in the incubators, with very poor results. I am of opinion that one of the causes of the failure to get good hatches was due to a lack of sufficient pure air in the hatching chamber.

Eggs set under hens hatched moderately well.

We are holding a much larger number of ducks over for breeding purposes, with a view to experimenting on the eggs in incubators, and it is hoped that we may be able to report more favorable results next season.

Some thirty ducks were hatched about the first of September. These ducks did especially well, and dressed, December 5th, nearly five and a half pounds each. This is noteworthy, because it is generally conceded that August duck eggs are of little use for incubation. Ducks hatched at this season would mature plenty early enough to suit the Christmas trade, and in many ways would be more profitable than the earlier hatched ones for the Christmas market.

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Fattening or Fleshing Chickens.

Our experiments this year cover a longer period of time than they have heretofore. We began in July, and will have a few to feed in January, when the special Short Course in Poultry is on.

Most of the chickens we fattened were sold in Montreal, and the remainder in Toronto. The chickens sold in Montreal were for local use, while the greater part of those sent to Toronto were for export. So far as I can gather from the dealers, they want a plump, five-pound, white-skinned chicken. The larger chickens, weighing from seven to nine pounds each, come into competition with the small turkey, and are therefore not as saleable as the smaller birds. Moreover, the average householder does not care to buy a very large chicken, when a medium-sized bird furnishes all the meat required for the family. The dealers do not, however, complain so much about the size as about the quality. They want birds that are plump, with plenty of meat on the breast, whether they weigh three pounds or seven pounds. During the season, I have had a few shipments of fatted chickens rated as No. 2, owing to the fact that their breast-bones were too high, or too deep, and their legs too long. The dealer in each case said the birds were plenty fat enough, but they lacked breasted meat, or plumpness. It is evident, therefore, that we must be careful in the selection of our breeding stock, and see that they are of a blocky type,—wide and full in the breast, but only moderately deep. The back should be wide and not too long; the legs short and well apart. Our experience during the last few years has been that we have to be quite as careful in the selection of the females as in the selection of the males. Many a fine cock-bird has left badly shaped chickens when mated with the leggy type of females.

As a rule, the birds that are plump when they weight about five pounds never mature into large, heavy-weight birds. They are mature, or fully developed, at nine pounds or under. It appears to me that, to make the greatest possible profit, we need to develop strains (no matter what breeds) that will mature quickly, and be plump when weighing from five to six pounds each.

My experience is, that to produce a ten to twelve pound male, we must have chickens with long bodies and legs, which are generally associated with deep breast bones. Where one has a good market for large chickens, there is no doubt that this class of birds will best serve his purpose; but it is very doubtful if they are as profitable as birds of the blocky, quick maturing type.

Fattening Chickens in July.

Early in July, several groups of chickens were put in crates for fattening. The results are given below :

Lot I. consisted of 12 Barred Rock cockerels, weighing when put into the crate, a total of 37 pounds.

	Lbs. Grain Consumed.	Lbs. Skim-milk Consumed.	Lbs. Gain.	Lbs. of Grain to make 1 lb. Gain.	Average Gain per Bird in 4 weeks.
1st week	17	25	9	1.8	
2nd "	24½	31	5	4.8	
3rd "	20	30	8	2.5	2.1 lbs.
4th "	22	33	4	5.5	

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Average amount of grain per pound of gain in 4 weeks, 3.2 lbs.

The birds were sold to a Montreal firm at 15 cents per pound f.o.b. here.

They were rather leggy, had high breast-bones, and would have dressed much better when they had reached a weight of 6 or 7 pounds.

Lot II. consisted of 8 high-grade Leghorns, weighing a total of 18 1-4 pounds.

	Lbs. Grain Consumed.	Lbs. Skim-milk Consumed.	Lbs. Gain.	Lbs. of Grain to make 1 lb. Gain.	Average Gain per Bird in 4 weeks.
1st week	7	10	4	1.8	
2nd "	11	16	1½	7.3	
3rd "	10	15	3	3.33	1.28 lbs.
4th "	7	10	1¾	4.	

Average of grain per pound of gain in 4 weeks, 3.4 lbs.

These chickens realized 13 cents per lb. f.o.b. here.

When dressed they were somewhat plumper than the Rocks, owing to their being mature; but they were rather small.

—	Pounds grain consumed.	Pounds skimmed milk consumed.	Pounds gain per week.	Pounds grain to make 1 lb. gain.	Average gain per bird in 4 weeks.
1st week	24	36	9½	2.6	
2nd week	27	41	9	3.	
3rd week	29	44	14	2.	
4th week	30	45	3	10.	1.77 lbs.

Average amount of grain per pound of gain in 4 weeks, 3.1 lbs.

These chickens dressed fairly well, the breasts being rather plump; but they had an excessive length of legs and neck.

This group was sold at 15 cts. per pound f.o.b. here.

The ration of grain fed three times a day to these lots was made up as follows :

	Parts.		Parts.
Barley meal	2	Finely ground oats	1
Corn meal or chop	2	Animal meal	1
Shorts or middlings	2		

This mixture was used with about one and one-half times its weight of skim-milk.

Feeding all Cooked Food.

We found it impossible to buy finely ground oats during the latter part of August; so we tried cooking rolled oats, barley, and corn-meal. The grains were used in the proportion of 50 per cent. of rolled oats and 25 per cent. each of barley and corn. These foods could not be used in the cramming machine without being first cooked.

Two groups of 12 birds were fed from the trough, one group for two weeks, and the other for only one week, with the following results :

Group I. consisted of 12 grade Plymouth Rock cockerels. They weighed, when placed in the crates, a total of 35 3-4 lbs. During the two weeks, they consumed 103 pounds of cooked food, or equal to about 34 pounds of uncooked grain. They made a gain of five pounds. At the end of the two-

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weeks the birds were very thin and sickly, their digestion being very bad. One of them died. The others were turned out on a grass run, and two of them died the second day they were out. The remainder are beginning to pick up again.

Another lot of 12 Rock chickens, weighing a total of 62 pounds, which had been fed the previous week on raw food, were given cooked food. During the week they were fed on cooked food they lost in weight, and three of them became so sick that they died. The remaining nine were placed on uncooked food the next week, and made a gain in weight of more than three-quarters of a pound each.

Two hundred chickens were crammed with cooked food. A few of the birds gained slightly, but the majority of them lost in weight. After having been fed in this manner for one week, a few of the best were shipped to a Toronto dealer, who complained about there being no meat on the breast. They sold for 9 cent per pound, and had they been well fatted they would have realized at least 13 cents per pound. The remaining birds were turned loose on a grass run.

The chief difficulty with the cooked food appears to be that it damages the chicken's digestion. Some of the birds that were put out on the grass run after being fed on cooked food, have not recovered yet,—three weeks after being turned out.

Cooked food can, no doubt, be fed to advantage in conjunction with raw food, but an all-cooked ration that is of a forcing nature appears to be entirely unsuitable for fattening fowls.

These chickens were practically a total loss. Those that were turned loose never fully recovered, and were not sold until about the beginning of December. When the food from September first to December first is figured, together with the decline in prices, there is a heavy loss.

Substitutes for Skim-Milk in Feeding.

During October and November, several trials were made with a common mixture of grain, wet with different substances, with a view to getting something that would give as good results as skim-milk. The results of these experiments are given below:

How fed.	Number of birds.	Weight when put up to feed.	Pounds of gain in two weeks.	Pounds of grain consumed.	Pounds of grain to make a pound of gain.	Pounds of milk consumed (estimated).	Cost of grain consumed at $1.40 per hundred.	Cost of milk at 10c. per hundred.	Total cost.	Cost of one pound of grain.	Remarks.
						whey.	cts.			cts.	
*Grain mixture wet with whey.	20	84	18	64	3.55	64	89.6	.....	89.6	4.9	This lot relished the ration and did fairly well.
						whey.					
*Grain mixture wet with whey.	20	67	16	75	4.69	75	105.0	.....	105.	6.56	Did not eat so well as the former group.
						whey.					
Average.....	....	....	17	69 5	4.12	69.5	97.3	.....	97.3	5.7	
Grain mixture wet with skim milk.	20	87	20	63	3.15	90	88 2	9.0	97.2	4.86	Relished food.
Grain mixture wet with skim milk.	20	67	21	64	3.20	90	89.6	9.0	98.6	4.7	Relished food.
Average.....	....	....	20.5	63.5	3.18	90	88.9	9 00	97 9	4.77	

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SUBSTITUTES FOR SKIM-MILK.—*Concluded.*

How fed.	Number of birds.	Weight when put up to feed.	Pounds of gain in two weeks.	Pounds of grain consumed.		Pounds of grain to make a pound of gain.	Pounds of milk consumed (estimated).	Cost of grain consumed at $1.40 per hundred.	Cost of milk at 10c. per hundred.	Total cost.	Cost of one pound of grain.	Remarks.
				Grain.	Animal meal.				Animal meal @ 2c. lb.			
*Grain mixture with 12 per cent. animal meal added and wet with water.	20	86	19	66	8	3.47	none	92.4	16	108.4	5.7	Relished food only moderately well.
*Grain mixture with 12 per cent. animal meal added and wet with water.	20	82	21	70	8.4	3.33	none	98.0	16.8	114.8	5.47	Relished food and did well.
Average..... ..	.....	.....	20	68	8.2	3.40	.....	95.2	16.4	111.6	5.58	
Grain mixture wet with skim milk and milk to drink.	20	65	20	49		2.45	100	68.6	10	78.6	3.93	Very careful attention was required to keep these birds in health.
*Grain mixture wet with water.	20	84	9	63		7	none	88.2	.....	88.2	9.8	Did not relish the ration.

* These chickens when dressed were not very white.

Summary:

1. Where a white skin is in demand, the skim-milk ration is the best one to use.

2. The most economical gain is made where the skim-milk is given to drink, in addition to the grain mixture being wet with it; but this mixture is only partially satisfactory, as the chickens require very careful attention to keep them healthy.

3. Where the mixture is wet with skim-milk and water given to drink is apparently the best ration.

4. The grain ration, to which 12 per cent. animal meal has been added and the ration mixed with water, is a very good one, but the flesh has a yellowish tinge.

5. The grain mixture wet with whey has given much better returns than we expected, and it seems to be a fairly good ration.

6. Grain mixture and water is not to be recommended. All these feeds, however, require further testing before definite conclusions can be reached.

My thanks are due to the heads of the other departments, who have rendered kindly assistance in many ways, and also to F. K. Dougherty, the department stenographer.

Respectfully submitted,

W. R. GRAHAM.

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PART XV

THE LECTURER ON APICULTURE.

To the President of the Ontario Agricultural College :

Sir,—I have the honor to present herewith my report on the work in the department of Apiculture.

The usual course of eighteen lectures was given in the Fall term to the First Year. The appliances I asked for in last year's Report were bought, and helped me greatly in the lectures, besides interesting the students considerably. By means of a hive on the lawn, I showed them how to handle bees and manipulate the parts of a hive. I teach a simple and up-to-date system of bee-keeping, and if a student takes full notes, and follows them, he can begin in the Spring and manage a limited number of colonies right through the several seasons of the year.

Stimulative Feeding.

Building up colonies in the spring by feeding so as to get an increased surplus in June and July.

Thirteen colonies were chosen; they were of medium strength, and none of them had a queen more than two years old. They were fed from May 1st to May 5th, as follows :

(a) Syrup, consisting of four pounds of granulated sugar to one quart of water was fed in Boardman feeders to three colonies, ten pounds of syrup to each colony.

(b) Ten pounds of this syrup was fed to one colony in a Miller feeder.

(c) Syrup consisting of granulated sugar and water in equal parts by measurement was fed in Boardman feeders to three colonies, ten pounds to each colony.

(d) A seven-pound frame of honey was placed in the middle of each of three hives, the caps having been first broken.

(e) Three colonies were not fed at all.

Results in surplus honey which was extracted July 23rd:

(a) Hive No. 1, 76 lbs.; No. 2, 81 lbs.; No. 3, 59 lbs.; average, 72 lbs.

(b) Only one colony was treated in this way, because the result was a foregone conclusion. The Miller feeder reduced the temperature of the brood chamber so much that the colony went back. It produced nothing and became strong only after the honey flow was practically over.

(c) Hive No. 1 had no surplus; No. 2, 43 lbs.; No. 3, 51 lbs; average, 31 lbs.

(d) Hive No. 1, 68 lbs.; No. 2, 71 lbs.; No. 3, 83 lbs.; average, 77 lbs.

(e) Hive No. 1, 57 lbs.; No. 2, 59 lbs.; No. 3, 55 lbs.; average, 56 lbs.

Conclusions :

(1) The temperature of the hive cannot be reduced without harm, as in the case of (b).

(2) To feed syrup that contains a large proportion of water is a positive detriment, presumably because the labor of ripening the syrup is too great a drain on the vitality of the old bees that have come through the winter. This labor would be all the more exhausting in this case, because this

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spring (1902) was very wet and cold; and in addition being very backward, there were fewer young bees than are usually to be found. Compare (c) with (a) and (d).

(3) In comparing (a) and (d) with (e), we see that there is an advantage to be gained by stimulative feeding, provided honey (of course, always ripened), or syrup containing the best possible amount of water, is fed. The cost of the syrup is two-thirds that of the honey, while the feeding of the honey in the way specified above is much less labor and there is no annoyance from robbing.

Respecting Quilts Used in Wintering in Chaff Hives.

Two years ago, a number of colonies were wintered outdoors in chaff hives. In packing these hives, we took the cover off of each brood chamber, exposing a quilt on top of the brood frames. We then placed eight inches of leaves on top of the quilts and a water-proof cover over all. The quilts were of enamel cloth. The chaff hives were opened the last of March, and the leaves above the enamel cloth were found to be dry; but when the quilts were lifted up, the brood combs were damp and in places mouldy. However, in four chaff hives the leaves were moist, while the combs were dry and free from mould. In these four cases, the quilts contained holes chewed through them by bees.

The next year, in order to prevent moisture in the brood chambers, wherever the enamel-cloth quilts were not perforated, a small stick, about the size of a pencil, was placed under the back of the quilt, so as to raise it a little off the hive to allow moisture to escape into the leaves. On some hives a quilt made of the plaited wrappings from tea chests was used, without raising it at all from the hive. The chaff hives were examined in March, and the results in every hive were the same, viz., that the moisture from each cluster had escaped from the brood chamber and had been absorbed by the leaves above.

Storing Honey in Paper Sacks.

It was learned in conversation that Americans were storing honey in paper bags. Flour bags called "eighths," of Manilla paper, were tried, but none were found tight enough to hold honey, through not being properly glued. But, aside from that, as long as the bags held honey, the paper did not become saturated or leak in any way, except through holes from the imperfect glueing.

Using Unfinished Sections.

This experiment was tried last year and repeated this year. Unfinished sections were left on a strong hive and other imperfect sections were stored in a hive empty of bees, and into it bees from the hive to be fed were carried on a piece of comb. These bees brought others from their colony. They cleaned out the sections as fast as they were given them, and finished out nicely the sections on their own hive. Robber bees continually tried to get at the sections that were being fed; but the bees that were put in possession kept them out completely. The entrance, however, had to be narrowed to one half of an inch.

Respectfully submitted.

H. R. Rowsome.

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PART XVI.

THE LIBRARIAN.

To the President of the Ontario Agricultural College:

Sir,—As College Librarian, I have much pleasure in submitting a brief report for 1902, as we have received much encouragement in our endeavors to build up the Library, assisted, as we have been, by the magnificent donation of the Library Building by the Massey family, of Toronto, and by a larger appropriation from the Legislature, which has enabled us to buy some back sets of periodicals that were greatly needed by several of the Scientific Departments. We trust that the appropriation given last year will be continued, as many back sets of periodicals are still needed.

W. J. Brown, B.S.A., of the Canadian Correspondence College, very kindly presented us with a complete set (6 vols.) of Lyddeker's New Natural History, and in his letter accompanying the gift, expressed the hope that the ex-students of the College would take an interest in the Library, and that the manifestation of this interest would be shown in gifts of books.

We are specially anxious to collect books or sets of periodicals on Canadian Agriculture, and we shall be glad to buy from any one who has books of this class.

Other gifts which we desire to acknowledge are:

Rothamstead Memoirs, Vol. 7.

Report of the Thompson Yates Laboratory.

The Penny Cyclopedia (20 Vols.), given by Rev. Jas. Harris, of Guelph.

Handbook of Insects Injurious to Orchard and Bush Fruits.—Miss E. Ormerod.

We also desire to acknowledge our appreciation of all our Exchanges, especially those of the United States Department of Agriculture, and the various Experiment Stations in America, India, Australia, and Europe.

During the year 1902, six hundred and thirty-nine books were added to the Library, classified as follows:

Agriculture	69	Entomology	28
Horticulture	58	Chemistry	71
Dairying	22	Geology	10
Entomological Reports	2	Veterinary Science	19
Botany	38	Zoology	22
Geology Reports	3	Domestic Science	2
Poultry	8	Hygiene	7
Nature Study	18	Bacteriology	19
Manual Training	6	Science	16
Hygiene Reports	2	English Literature	60
Biology	14	Forestry	7
Science Reports	16	Apiculture	2
Physics	43	Mathematics	1
Agricultural Reports	57	History	6
Horticultural Reports	25		

The number of books bound was 250.

The Library received by purchase or exchange 136 periodicals, most of them bearing on Agriculture.

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The total number of bound books on our shelves is 10,027, and between three and four thousand pamphlets.

We have added this year a large steel case, containing 96 compartments for filing current bulletins, etc.; 5 card-case cabinets; a Hammond typewriter for writing our index cards; 45 leather covers for current magazines; and a large quantity of other smaller Library supplies, such as book supports, shelf label holders, pamphlet boxes, index cards, etc.

Respectfully submitted,

F. C. HARRISON.

PART XVII.

THE PHYSICIAN.

To the President of the Ontario Agricultural College:

Sir,—I have the honor of presenting to you my report for the year.

Examination of my records shows that respiratory and digestive disorders were of frequent occurrence, and that tonsilitis, etc., causes a large share of our illness.

In addition to the numerous minor injuries which came under my care, I was called upon to attend a student whose hand was severely lacerated in a turnip-pulper. It was several weeks before he fully recovered the use of the injured member.

I have to report one case of appendicitis. The patient made a good recovery, but on account of his illness gave up his course in the College and returned home.

Mumps and measles invaded the college in January and December respectively, but, thanks to thorough preventive measures, only one case of each disease occurred.

Owing to the outbreak of smallpox in an adjoining township, and in many other parts of the Province, you issued instructions in January for a general vaccination around the College, and accordingly I vaccinated more than one hundred and sixty students, servants, and others connected with the institution.

Among the many improvements being made in the College building, I am glad to note the installation of an electric light system, which will do away with the dangers attending the use of gas, from which we so narrowly escaped a sad experience a year or two ago.

I am glad to report that the general sanitary condition of the College is excellent.

Respectfully yours,

W. O. STEWART,

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FINANCIAL STATEMENT, 1902.

I. COLLEGE EXPENDITURE.

(a) College Maintenance.

1. *Salaries and Wages*		$26,958 01	
2. *Food:*			
	Meat, fish and fowl	5,924 79	
	Bread and biscuits	1,192 80	
	Groceries, butter and fruit	6,009 27	
3. *Household Expenses:*			
	Laundry, soap and cleaning	278 64	
	Women servants' wages	2,115 45	
4. *Business Department:*			
	Advertising, printing, postage and stationery	1,704 03	
5. *Miscellaneous:*			
	Maintenance of chemical laboratory	619 17	
	do physical "	356 83	
	do biological "	582 24	
	do bacteriological laboratory	370 73	
	Library, reading room, books, papers and periodicals	2,544 86	
	Scholarships	108 40	
	Unenumerated	1,426 19	
	Short courses in judging	227 14	
	*Telephone service, rent and messages	123 94	
	School assessment, S. S. No. 7	50 40	
	Temporary assistance	79 00	

*Telephone service, etc., transferred to Miscellaneous in Audit Office Report, to balance.

(b) Maintenance and Repairs of Government Buildings.

Furniture and furnishings	1,895 81	
Repairs and alterations	1,452 98	
Fuel	2,910 13	
Light	1,237 42	
Sewage Disposal	450 60	
		$38,613 83

College Revenue.

Fees	4,146 15	
Balance on board account, after deducting $5,924.60 allowances for student labor (See below)	10,252 34	
Supplemental exams	60 00	
Sale of tuberculin	6 50	
Contingencies	9 25	
Refund express charges	6 10	
Sale of old horse	25 00	
Sale of old buggy	15 00	
Analysis of city water	5 00	
*Rent of post office boxes, Sept. 1901—Sept. 1902	32 75	
*Fines and breakages, 1900-1901	65 39	
Chemical laboratory, breakages, 1902	100 00	
Post office box rent, Sept 1902—Sept. 1903	37 50	
Fines and breakages, 1901-1902	97 20	
Rent of houses	86 00	
		14,944 18
		$43,669 65

*Held over from last year on account of late bursar's death at time when the annual statements were being made out.

Students' Labor to Different Departments.

Jan'y 1st to Dec. 19th, 1902. (*Paid from College Revenue.*)

Farm department	$1,652 39
Experimental department	1,503 13
Horticultural "	1,003 31
Dairy "	291 28
Poultry "	592 46
Mechanical "	322 79
College "	67 24
Engineer's "	103 02
Library	6 80
Bacteriological laboratory	49 51
Physical "	82 01
Chemical "	173 60
Biological "	77 06
Total (as above)	$5,924 60

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II. FARM EXPENDITURE.

(a) Farm Proper and Experimental Feeding.

1. *Permanent Improvements*		$509 68	
2. *Maintenance*:			
Wages of foreman and men	$3,657 08		
Live stock, cattle for feeding	4,086 55		
Maintenance of stock	1,748 38		
Seeds	206 40		
Binder twine	60 55		
Repairs, alterations, blacksmithing	513 43		
Furnishings	229 98		
Tools and implements	313 10		
Advertising, printing, postage, and stationery	48 66		
Fuel and light	6 45		
Experimental feeder	376 00		
*Contingencies	265 03		
Purchase of team	450 00		
		11,961 61	
			$12,471 29

Farm Revenue.

Sale of Stock:			
Cattle, (40)	$3,219 25		
Pigs, (132)	1,992 29		
Sheep and lambs, (24)	134 50		
Horse	65 00		
Balance on team	5 00		
		$5,416 04	
Miscellaneous Sales:			
Vetches	5 00		
Potatoes, 400 bags	199 75		
Barley	10 20		
Wool	19 18		
Hides and skins	4 95		
Old iron	4 00		
Milk	88 48		
Ensilage	5 00		
Service of animals	134 00		
		470 56	
			5,886 60
†Net expenditure			$6,584 69

Difference from auditor's report will be found in Miscellaneous account.

†Net expenditure, allowing nothing for supplies to College, feed for dairy stock, keep of horses for College and other departments, etc.

Note.—This statement includes only the cash transactions of the year.

(b) Field Experiments.

Permanent Improvements		$ 864 79	
Experimentalist, salary	$1,500 00		
Foreman, salary	499 99		
Teamsters, wages	578 76		
Other laborers, wages	2,143 31		
Seeds	526 77		
Manure	114 03		
Furnishings, repairs, blacksmithing, etc	267 70		
Printing, postage and stationery	61 11		
Stenographer	300 00		
Assistant experimentalist (part year)	300 00		
Contingencies	150 64		
Horse	140 00		
		6,582 31	
Net expenditure on field experiments			$7,447 10

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III. DAIRY DEPARTMENT.

(a) Dairy School.

Wages of Instructors	$1,741 50	
Engineer (3 months)	90 00	
Furnishings, repairs, paintings, etc	516 17	
Dairy appliance	398 79	
Fuel and light	250 00	
Advertising, printing, postage and stationery	125 20	
Lectures in Domestic Science	5 90	
Contingencies	14 61	
Milk for use in School	4,869 60	$8,011 77
Permanent improvements		4 50
		$8,016 27

Revenue.

Fees	$115 10	
Sales of butter, 21,787 lbs, at from 15 to 23c	4,597 83	
" cheese, 7,556 lbs., at from 8 to 11c	775 70	
" skim-milk and whey	20 10	
" cream, 21½ pints	4 33	
Contingencies, breakages	2 00	
Sales of milk and buttermilk	3 00	
Sundries—milk can, 3.75; old churn, 1.00; curd mill, 10.00	14 75	
		5,532 81
Net expenditure		$2,483 46

(b) Experimental Dairy.

Foreman (9 months)	$473 61	
Cheesemaker (9 months)	499 99	
Assistant in experimental work (9 months)	249 97	
Wages of cattleman, etc	483 71	
Purchase of milk for experiments	5,684 41	
Cows	410 06	
Feed and fodder	680 68	
Furnishings and repairs	718 88	
Fuel and light	270 46	
Laboratory expenses, chemicals, etc	1 10	
Contingencies	192 63	
Advertising, printing, postage, stationery	133 38	
Engineer (9 months)	225 00	
		10,083 83

Revenue.

Sales of butter, 25,587 lbs., at from 15 to 24c	$5,107 53	
" cheese, 8,312¼ lbs., at from 7 to 12c	870 40	
" milk, 15,689½ qts., at 4c	627 59	
" skim-milk and whey, 131,200 lbs., at 10c per cwt	131 20	
" cream, 22 gals. at 60c, 2 gals. at 80c	14 80	
" cattle:—		
7 grade calves, a few days old	15 50	
1 bull calf	10 00	
7 grade heifers	152 00	
6 dry cows	235 00	
Sale of hide	3 00	
" pasteurizer	35 00	
" 3 cheese vats	25 00	
" milk cans, 4.50; old churn, 5.00; old iron, 60c	10 10	
Fees	8 00	
		7,245 12
Net expenditure		$2,838 71

Allowing nothing for milk or cream supplied to College, value $882.18, at 4 c. per qt.

IV. POULTRY DEPARTMENT.

Wages of assistant	$414 00	
Purchase of stock	77 25	
Furnishings, repairs, etc	206 47	
Feed, etc	267 94	
Fuel, light and contingencies	180 58	
Experiments in fattening poultry	1,006 07	
		$2,152 31

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REVENUE.

Sale of Eggs:			
102⅛ sets for hatching	$142 05		
80 eggs for hatching	4 00		
426¾ doz. for domestic use	82 93		
		$228 98	
Sale of Poultry:			
Live birds	$119 55		
Dressed birds	529 40		
Feathers	4 10		
		653 05	
			881 03
			$1,207 28

V. HORTICULTURAL DEPARTMENT.

Permanent Improvements		$101 10
Maintenance:		
Salary of head gardener and foreman	$700 00	
Salary of assistant gardener and florist	540 00	
Salary of assistant in greenhouses	398 31	
Teamster	382 00	
Wages of laborers	1,538 23	
Manure and fertilizers	87 75	
Seeds, bulbs, plants, trees, etc.	322 83	
Furnishings, repairs, implements and tools	657 24	
Fuel and light	179 75	
Contingencies	308 22	
Fellow for 7 months	213 58	
		5,327 92
		$5,429 02

REVENUE.

Sale of vegetables	$ 2 50	
" strawberries, to officers, 33⅜ crates, at 1.00	33 67	
" fruit trees	2 50	
" old bones	2 88	
Use of garden team	6 00	
		47 55
Net expenditure		$5,418 02

NOTE.—Ordinarily there is no revenue from this department, as the produce is used by the College, and, because of complaints from Guelph market gardeners, the Department is not allowed to sell even the surplus.

VI. MECHANICAL DEPARTMENT.

Salary of foreman	$749 99	
Tools, fuel and light	125 19	
		$875 18
Total expenditure		$875 18

SUMMARY, YEAR 1902.

Total net expenditure on Maintenance Account:		
I. College and Government Buildings	$43,669 65	$43,669 65
II. Farm:		
1. Farm proper and Experimental Feeding Department	6,584 69	
2. Field Experiments	7,447 10	
		14,031 79
III. Dairy:		
1. Dairy School	2,483 46	
2. Experimental Dairy	2,838 71	
		5,322 17
IV. Poultry	1,270 28	1,270 28
V. Horticultural Department	5,418 02	5,418 02
VI. Mechanical Department	875 18	875 18
Total net expenditure, 1902		$70,587 09

S. SPRINGER,
Bursar.

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TWENTY-FOURTH ANNUAL REPORT

OF THE

Ontario Agricultural and Experimental Union

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO

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1903

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THE AGRICULTURAL AND EXPERIMENTAL UNION.

ANNUAL MEETING.

The twenty-fourth annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College on Monday and Tuesday, December 8th and 9th, 1902.

The President of the Union, Mr. T. G. Raynor, Rosehall, Ontario, presided over the three-day sessions; Miss Laura Rose, Guelph, Ontario, presided at one of the Ladies' Sessions, and Miss B. Maddock, Guelph, Ontario, persided at the other Ladies' session; the Hon. John Dryden acted as Chairman at the evening session, and Dr. James Mills at the annual banpuet.

SECRETARY'S REPORT.

By C. A. Zavitz, B.S.A., Agricultural College, Guelph.

A report of the proceedings of the last annual meeting of the Experimental Union, including addresses, reports of experiments, and discussions, was prepared for publication and forwarded to the Ontario Department of Agriculture in January of last year. This material, when printed, filled a volume of sixty-two pages. About 25,000 copies of the report were printed and distributed throughout the Province. It will, therefore, be seen that the results of the Union work were brought very prominently before the farmers of Ontario.

Since our last meeting, the Board of Control has met on three different occasions, twice in December, 1901, and once in September, 1902.

Co-operative experiments were conducted throughout Ontario in 1902, in agriculture, horticulture, economic botany, poultry raising, and forestry. The summary results and the principal conclusions of these experiments, conducted on more than 3,000 Ontario farms within the past year, will be presented and discussed at the various sessions of this meeting.

The Experimental Union certainly has good ground for encouragement. The number of experiments is increasing from year to year; the membership is larger than ever before; and the co-operative work is extending in influence as well as in magnitude. Within the past year, we have been asked for information about our methods of conducting co-operative experiments by each Province of the Dominion, and by the Governments of both the United States and Canada.

TREASURER'S REPORT, 1902.

By Prof. H. L. Hutt, Guelph.

Receipts.		Expenditures.	
Balance from 1901	$ 275.39	Agricultural experiments	$910.22
Membership fees	146.50	Horticultural experiments	236.07
Government grant	1,400.00	Poultry experiments	76.70
		Part expenses annual meeting, 1901.....	103.16
		Part expenses annual meeting, 1902.....	90.00
		Meeting of Executive..	13.45
		Salary of Secretary	205.00
		Balance on hand..... ..	187.29
	$1,821.89		$1,821.89

We, the undersigned Auditors, beg leave to say that we have examined the accounts of the Treasurer, and found them correct.

Dec. 6th, 1902.

W. J. RUTHERFORD.
W. P. GAMBLE.

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PRESIDENT'S ADDRESS.

By T. G. Raynor, B.S.A., Rosehall.

Our organization has added one more year to its history since we last met. It is certainly true when we say that this has been a year of agricultural advancement in our Province.

We welcome you all most heartily to this our twenty-fourth annual reunion, whether you are members of our Experimental Union, officers and students of our Alma Mater, Farmers' Institute delegates, or visitors.

In reviewing the history of the past year, we notice that events of considerable moment have taken place. Among these have been the coronation of our King, who has always interested himself in agricultural pursuits; the close of a long and disastrous war in South Africa, by which large sister colonies have been honorably added to the great British Empire, of which we are proud to form an integral part; the locking up for a time of large quantities of anthracite coal by three or four men, which has awakened great interest in the world's fuel supply; and last, but not least, the voting upon a great moral issue on the 4th inst. From an agricultural standpoint, it has been a red-letter year in our history. Through the blessings of a kind Providence, associated with man's best efforts, Mother Earth has fairly groaned beneath her load of agricultural products from one end of our Dominion to the other. It is pleasing to notice that our farmers are manufacturing more and more of the raw material of the farm, such as hay and grain, into the finished product, such as meat, butter, and cheese, the export trade of which has been very satisfactory during the past year.

Perhaps nowhere have the farmers' efforts been more largely rewarded than in our own Province. Besides a bountiful harvest, the handling of which has taxed the strength and ingenuity of our farmers to the utmost extent in order to cope with the frequent and heavy rains and the scarcity of both male and female labor, good prices have prevailed for most lines of farm produce. As the result, a general wave of prosperity has swept over our land, which gives us all that happy and contented feeling which I believe I see depicted on your faces to-day. These events should have their lessons, but we should not bank on this continuing for ever. Let us learn lessons of Providence from the past decades, and "in time of peace prepare for war."

I am very glad to be able to report a most successful year in connection with the work of our Union. As you have perhaps noticed on the programme sheet, the work has had a steady and substantial growth from the very small beginning in 1879, when our Union was first organized, and later in 1886, when one of the features to cement the bond of union between our Alma Mater and her alumni was the inception of experiments with field crops. When the co-operative experiments were first started in 1886, we had twelve experimenters, and the number has steadily increased, until we now have about 4,000 who are watching carefully the experiments under their charge every year. It is impossible to estimate the good that comes to the individual by cultivating his observing faculties and in encouraging method and accuracy.

Among the experimenters were men and women, young and old, and it is pleasing to notice that some of the experiments were carried on in New Ontario, in whose progress we are deeply interested at the present time.

Horticulture has not been neglected in our work. We have had in all some 1,200 experimenters engaged in work along this line. The effect of this is seen in the distribution of small fruits, old and new, in places where they might otherwise never have found their way. It has also encouraged and

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stimulated many farmers to have a fruit as well as a vegetable garden. These experiments are becoming more valuable each year as the area devoted to fruit growing is increasing.

Experiments have also been conducted in forestry, economic botany, and poultry raising, all of which have been useful.

Owing to the rapid over-clearing of our forests, and the baneful results following the same, a committee on forestry was appointed last year for the first time. This committee will report during our meeting. In other years, special prominence has been given to advanced ideas along the lines of fruit-growing, soil cutivation, and sugar beet growing. This year we have an expert in forestry with us, and this subject will receive special attention. We trust that something of a very practical nature will follow an awakening along this line.

From the programme, you will notice that a discussion on a fungous disease, and, incidentally, on injurious insects, may follow. I wish to call your attention to two bulletins on the "Pea Weevil" now in the press for distribution, one being published by the Dominion and the other by the Ontario Department of Agriculture.

One other bond of union between the past and present students of the College is the "O.A.C. Review." We congratulate the management on the excellence of the paper this year. A steady advance has been made each year since its inception, and it should be very largely patronized by the ex-students.

We notice with satisfaction the completion of the two splendid buildings on the College campus. We also feel gratified to know that Sir Wm. Macdonald has added another $25,000 to the $125,000 grant for the erection and equipment of the buildings for the teaching of nature study and domestic science.

We also desire to draw your attention to the forward movement in connection with our Union work in arranging for two sessions on household economics for our lady visitors and delegates.

Our College register, under the direction of our energetic secretary, is nearing completion and will soon be ready for publication in pamphlet form.

In order to carry on our work successfully for another year, without enlarging on last year's effort, we will need an additional grant of $500. Our grant is now $1,400, and it is claimed by many that no money furnished by the Government is better expended. Owing to a change made in the postal rates last year, the postage required for sending experimental material will be doubled. Our postage last year was fully $400.

It is the object of the Union to increase the amount of seed sent to experimenters rather than to diminish it. Better work can be done by the experimenter in this way, and it is more of an incentive to do accurate work. In view of the acknowledged good work accomplished by our Union in the past, there should be no difficulty in securing an increased grant.

In conclusion, I wish to thank you for the honor conferred upon me in electing me President for the second time in the history of our Union.

Again, on behalf of the Union, I extend to you all a most cordial welcome, and would ask you to help in every way you can to make this meeting an unqualified success.

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CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

By C. A. Zavitz, Director of Experiments, Agricultural College, Guelph.

For the sixteenth time, I am asked to present the report of the co-operative experiments conducted in agriculture throughout Ontario. The work of the past year has been one of progress, as is shown by the fact that no less than 3,135 separate experiments were conducted on an equal number of farms. The increase in the number of experimenters in field agriculture can be seen by the following figures, which show the exact number which were actually engaged in the work in each of several years: 1886, 12; 1887, 60; 1888, 90; 1891, 103; 1892, 754; 1894, 1,440; 1896, 2,425, 1901, 2,760; and 1902, 3,135.

The co-operative experimental work is operated conjointly by the Ontario Agricultural College and the Ontario Agricultural and Experimental Union. The great bulk of the co-operative experiments have been conducted by the farmers themselves upon their own farms. Recently, however, the Union has secured the co-operation of the directors of some of the Agricultural Societies, and experimental crops have been grown on the exhibition grounds, which formed object lessons of great interest at the time of the "Fall Fairs." The officers and members of the Farmers' Institutes have also become interested in the experimental work, and in some instances have united in carrying on a large number of co-operative tests. Besides these, various seedsmen, editors, and school teachers have taken up the work with a great deal of enthusiasm, and have obtained object lessons and definite information, both of which have proven valuable.

The Union opens up a channel through which some of the best material of the Experiment Station can be brought to the homes of the farmers; it makes direct application of the information gained at the Station by having experiments conducted on hundreds, and even thousands, of farms; and it systematizes the co-operative work in such a way that the results of those experiments which have been conducted with care and accuracy can be summarized and made into valuable reports for the guidance of farmers generally. It combines in an admirable way the training of the hands and the intellect, and is one of the greatest educational features which has been introduced throughout the rural districts of Ontario in recent years.

Great care is exercised in planning the various co-operative experiments in such a way that they can be successfully undertaken by the people who are to be benefited thereby. Some experiments are simple, and some are more complicated, but in every instance the work is made as clear of comprehension, as definite of purpose, and as simple in method of operation as is consistent with the objects desired. It is the constant aim to make all experiments as interesting, as valuable, and as extensive as it is possible to make them. It is probably due to the care taken in the selection and the planning of the experiments, and to the kindly interest manifested towards the experimenters themselves, that the co-operative work has become so extensive in its operation, so popular among the people, and so far-reaching in its results. It is a work which has been fruitful in promoting agricultural science, in increasing agricultural investigations, and in diffusing practical information among the farmers of Ontario. It has led the farmers to feel that the Experimental Station was working for their good, and has thereby caused a deep interest in the work of both the Station and the College. The interest taken in the institution is shown by the fact that it was visited by Ontario farmers to the number of 23,000 in June of 1900; 28,000 in June of 1901; and

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31,000 in June of 1902. The work has undoubtedly helped to overflow the College with an attendance of about 500 agricultural students annually. It is exerting an influence throughout Ontario which is wholesome in its character, extensive in its operation, and far-reaching in its results.

The experimenters deserve great credit in successfully conducting the various experiments during the past season, and the farmers owe much to these experimenters for the valuable reports which they have furnished, the summaries of which are here presented.

The following circular was sent out in the spring of the present year, and gives the list of experiments as well as other information regarding the work:

DEAR SIR.—The members of the Ontario Agricultural and Experimental Union are pleased to state that for 1902 they are again prepared to distribute into every Township of Ontario material for experiments with fodder crops, roots, grains, grasses, clovers, and fertilizers. Upwards of 1,200 varieties of farm crops have been tested in the Experimental Department of the Ontario Agricultural College, Guelph, for at least five years in succession. These consist of nearly all the Canadian sorts, and several hundred new varieties, some of which have done exceedingly well in the carefully conducted experiments at the College, and are now being used for co-operative experiments throughout Ontario.

The co-operative experimental work was started in Ontario in 1886, with 12 experimenters. In 1901, there were upwards of 3,000 Ontario farmers conducting the co-operative tests upon their own farms. The average number of experiments each year for the four years ending with 1889 was 73; with 1893, 557; with 1897, 2,059; and with 1901, 3,157.

Each person in Ontario who wishes to join in the work may choose any one of the experiments for 1902, fill out the accompanying form of application, and return the same to the Director of the Co-operative Experiments in Agriculture at as early a date as possible. The material will be furnished in the order in which the applications are received until the supply is exhausted. A sheet containing the instructions for conducting the chosen experiment, and the blank form on which to report the results of the work, will be sent to each experimenter at the time the fertilizers or seeds are forwarded. All material will be furnished entirely free of charge to each applicant, and the produce of the plots will, of course, become the property of the person who conducts the experiment. In return the Committee on Agricultural Experiments desires to ask that each experimenter will sow all the plots belonging to the particular experiment which he has chosen for 1902, and that he will be very careful and accurate in his work, and forward to the Director a complete report of the results obtained from the test, as soon as possible after the plots are harvested.

All seeds and fertililizers will be sent in good time for spring seeding, providing the applications are received at an early date. The supply of material being limited, those who apply first will be surest of obtaining the desired outfit. It might be well for each applicant to make a second choice, for fear the first could not be granted. The experiment selected should be indicated by using its number as given in the left hand column in the list of experiments. Further information is given on the application form which is enclosed.

LIST OF EXPERIMENTS FOR 1902.

	Plots.
Grain Crops.	
1—Testing three varieties of Oats	3
2—Testing three varieties of six-rowed Barley	3
3—Testing two varieties of Hulless Barley	2
4—Testing Emmer (Spelt) and two varieties of Spring Wheat	3
5—Testing two varieties of Buckwheat	2
6—Testing three varieties of Field Peas for Northern Ontario	3
7—Testing two varieties of bug-proof Field Peas	2
8—Testing Cow Peas and two varieties of Soy, Soja, or Japanese Beans	3
9—Testing three varieties of Husking Corn	3
Root Crops.	
10—Testing three varieties of Mangels	3
11—Testing two varieties of Sugar Beets for feeding purposes	2
12—Testing three varieties of Swedish Turnips	3
13—Testing Kohl Rabi and two varieties of Fall Turnips	3
14—Testing Parsnips and two varieties of Carrots	3
Forage, Fodder, Silage, and Hay Crops.	
15—Testing three varieties of fodder or silage Corn	3
16—Testing three varieties of Millet	3
17—Testing three varieties of Sorghum	3
18—Testing Grass Peas and two varieties of Vetches	3
19—Testing Dwarf Essex Rape and Thousand-headed Kale	2
20—Testing three varieties of Clover	3
21—Testing Sanfoin, Lucerne and Burnet	3
22—Testing five varieties of Grasses	5
Culinary Crops.	
3—Testing three varieties of Field Beans	3
4—Testing three varieties of Sweet Corn	3

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Fertilizer Experiments.

25—Testing fertilizers with Corn 6
26—Testing fertilizers with Swedish Turnips 6

Miscellaneous Experiments.

27—Growing Potatoes on the level and in hills 2
28—Testing two varieties of very early Potatoes 2
29—Planting Out Potatoes which have and which have not been coated over with land plaster.. 2
30—Planting Corn in rows and in squares (an excellent variety of Early Corn will be used)..... 2

The size of each plot in each of the first twenty-six experiments is to be two rods long by one rod wide; in Nos. 27, 28 and 29, one rod square; and in No. 30, four rods square (one-tenth of an acre).

Some Advantages of the Co-operative Experiments.

1.—Farmers who conduct these co-operative experiments in their own field with varieties of farm crops, methods of cultivation, ways of increasing soil fertility, etc., obtain valuable information which they cannot possibly get in any other way.

2.—The Union furnishes a good method by which farmers can secure pure seed of the best varieties of grain, root, fodder, silage, and hay crops to test on their own soils, and thus find out in a very practical way which special kinds are best suited to their own particular farms.

3.—Experimental work encourages careful handling, close observation, accurate calculation, and economical methods.

4.—Experimenters get a start in pure seed of the best varieties of grain crops, which rapidly increases in quantity, thus furnishing seed for sowing on large areas and for selling at good prices.

5.—The co-operative experiments located on over three thousand Ontario farms form object lessons for the farmers in their respective neighborhoods.

6.—Farmers are frequently enabled to purchase pure seed of leading varieties of grain from their neighbors who are successful experimenters.

7.—Summary results and important conclusions from successfully conducted co-operative experiments are printed annually in the report of the Experimental Union, which is distributed in large numbers from the Department of Agriculture, Toronto, Ontario.

8.—Important features of the experiments are frequently discussed in the field, at the fireside, and in the meetings of farmers' institutes.

9.—Results of experiments conducted by other farmers and by the Experiment Stations are read with increased interest.

10.—Properly conducted experimental work adds pleasure to farm life and forms a very wholesome influence in keeping the boys on the farm.

11.—The whole system leads to a substantial increase in farm profits, and to a steady advance in agricultural education throughout Ontario.

Each year the co-operative experiments are located in both New Ontario and Old Ontario, and on small farms as well as on large farms; and the experimenters themselves are comprised of both men and women, highly educated and self-educated, old and young, married and single, rich and poor, who do the work for their own good and for the good of others.

Comments on the Co-operative Experimental Work.

"I am positive that I can get more practical information from the Union experiments than in any other way."—C. W. Otis, Oxford County.

"I have been greatly benefited by the experimental work. All the grain which I sow came originally from the Experimental Union. Nearly 1000 people saw my experiment this year, and I believe 10,000 people will see my experiment in 1902."—S. L. Simpkins, Hastings County.

"In my official capacity as Superintendent of Farmers' Institutes I come in contact with farmers in every part of Ontario, and I find that thinking farmers in all parts of the Province are of the opinion that no work has done so much to increase the yield of farm crops as the work of the Experimental Union.—G. C. Creelman, Toronto, Ont.

Every man who conducts an experiment upon his own farm is made responsible for the work, and is urged to do the best he can for himself, for his neighbors, and for the Union. The following application form for experimental material was sent with each circular with a request that those who were desirous of conducting experiments during the coming season fill out the form of application and return it to the College at their earliest convenience:

If you wish to conduct one of the thirty agricultural experiments named on the accompanying circular, kindly fill out this blank form and return it as soon as possible.

The distribution will be confined to the choice varieties included in the various experiments. In filling out the blank form, therefore, it is neither necessary nor advisable to mention any particular variety or varieties.

Material for either number 25 experiment or number 26 experiment will be sent by express, for each of the others it will be forwarded by mail.

Address all communications to

C. A Zavitz,
Agricultural College, Guelph, Ont.

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APPLICATION FOR MATERIAL FOR AN EXPERIMENT.

"I would like to conduct experiment number...., but if all the material for that experimnet has been applied for before my application is received I select experiment number..... as my second choice. If the material for one of these two experiments is forwarded to me, I will endeavor to

1. Carry on the test according to the instructions received with the seed,
2. Exercise care and accuracy in the work, and
3. Report the results of the experiment as soon as possible after harvest, whether successful or not.

Name.....
Post Office.....
Express Office.....
Line of Railway.....
County.....
Date of Mailing.....

The reports of the co-operative tests were very carefully examined, and those which were complete and which showed carefulness and reliability throughout were summarized. While these summaries should be of great value to the farmers generally, still those who conducted the experiments obtained much additional information regarding the results of their experiments as adapted to their individual circumstances, which it is impossible to convey in a concise report of this kind.

RESULTS OF CO-OPERATIVE EXPERIMENTS.

The following are the average results of the co-operative experiments successfully conducted over Ontario in 1902 with grain crops; root crops; forage, fodder, silage, and hay crops; culinary crops; the application of fertilizers; methods of cultivation, etc.

GRAIN CROPS.

Experiments.	Varieties.	Comparative value.	Yield per acre.	
			Straw. (tons.)	Grain. (lbs.)
1. Oats (96 tests)	Oderbrucker	100	1.7	1,790
	Siberian	95	1.7	1,737
	Alaska	51	1.4	1,398
2. Six-rowed barley (17 tests)	Oderbrucker	88	1.6	1,725
	Mandscheuri	100	1.6	1,672
	Duckbill	65	1.7	1,503
3. Hulless barley (16 tests)	Black Hulless	100	1.5	1,536
	White Hulless	88	1.4	1,278
4. Spring wheat (31 tests)	Emmer	100	1.9	2,126
	Wild Goose	88	1.7	1,902
	Red Fife	61	1.4	993
5. Buckwheat (2 tests)	Japanese	100	2.8	1,133
	Silver Hull	100	3.1	1,126
6. Peas (26 tests)	Early Britain	94	1.2	1,166
	Canadian Beauty	100	1.4	1,132
7. Bug proof peas (10 tests)	Egyptian	88	1.0	770
	Grass	100	1.5	725
8. Soy beans (2 tests)	Medium Green Soy Beans	80	1.4	1,210
	Early Yellow Soy Beans	100	1.7	860
9. Corn for grain (12 tests)	Compton's Early	84	whole crop. 11.0	3,180
	King Phillip	100	10.3	2,991
31. Winter wheat (18 tests)	Dawson's Golden Chaff	100	straw. 3.2	1,362
	Imperial Amber	78	3.2	1,920
	Early Genesee Giant	55	3.1	1,770
	Michigan Amber	50	3.3	1,650
	Turkey Red	47	3.1	1,614

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In the first column of figures in the table here presented, the highest results of the comparative value of the different varieties are given, 100 representing the most popular variety in each class of grain. These figures are the summary of the answers given by the experimenters in regard to the relative value of each variety as the result of individual tests throughout the Province. The yield of straw, as here reported, represents the total crop less the amount of grain, and would, therefore, include the chaff or the husks with the straw or the stalks. The yield of grain is given in pounds instead of bushels per acre. It is thought that a presentation of the results in this form would be much clearer, owing to the variation of the weight per measured bushel of the different classes of grains under consideration.

Oats. Three varieties of oats were carefully and successfully tested on 96 different farms throughout Ontario in 1902. From the average results here presented, it will be seen that the Oderbrucker gave an average of 53 pounds per acre more than the Siberian variety. This is the sixth year that these varieties have been tested throughout Ontario in competition with one another. In four out of the six years, the Siberian variety produced the greater yield per acre, and in the other two years the Oderbrucker surpassed the Siberian. Taking the average of the six years, we find that the Siberian produced a yield of about one bushel more than that of the Oderbrucker variety. The Siberian oats occupied first place in yield of grain per acre in the average results of 125 experiments in 1892; of 105 in 1893; of 121 in 1894; of 78 in 1895; of 106 in 1898; of 107 in 1899; of 97 in 1900; and of 102 in 1901. In each of the past three years, each experimenter was asked to sow an extra plot with the variety of oats which had proven the best in his past experience. The American Banner variety was used as the extra variety by sixteen experimenters in each of the years 1900 and 1901, and by twelve experimenters in 1902. In taking the average results of these different experiments in each of the three years, we find that the Siberian gave 2.6 bushels per acre more than the American Banner in 1900, two bushels per acre more in 1901, and 6.2 bushels per acre more in 1902. It will, therefore, be seen that the Siberian, the Oderbrucker, and the American Banner varieties of oats are close rivals throughout Ontario. In the average tests at the College in growing these three varieties for the past ten years, it is found that the Siberian has given rather the best results. The Alaska oats are very early in reaching maturity, and when sown with Mandscheuri or the common six-rowed barley, will mature at about the same time as either of these varieties.

Barley. Two six-rowed varieties and one two-rowed variety of barley were distributed throughout Ontario for co-operative experiments in 1902. As usual, the two-rowed barley gave the lowest yield of grain per acre. It will be seen from the average results here presented that the Oderbrucker surpassed the Mandscheuri in 1902 by an average of 47 pounds, or about one bushel of grain per acre. This is the tenth year that these two varieties have been tested against each other in the co-operative experiments throughout Ontario. The Mandscheuri surpassed the Oderbrucker in the tests of each of seven years, and the Oderbrucker surpassed the Mandscheuri in the tests of each of three years. Taking the average of the whole ten years in which these two varieties have been tested over Ontario, we find that the Mandscheuri surpassed the Oderbrucker by 2.6 bushels of grain per acre. The Mandscheuri variety has produced a greater average yield of barley per acre than any one of all the varieties tested at the College within the past twelve years.

Hulless Barley. For three years in succession, hulless barley has been tested in a separate experiment throughout Ontario. Two varieties have been

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tested each season. The Black Hulless surpassd the White Hulless by 2.2 tons per acre in 1900, by 5.3 bus. per acre in 1901, and by 4.3 bus. per acre in 1.02. The Black Hulless, although somewhat weak in the straw, usually produces a large yield of grain.

Spring Wheat. Three varieties of spring wheat, each representing distinct types, were distributed for co-operative experiments in 1902. The Red Fife is used principally for the production of flour, the Wild Goose for the production of macaroni, and the Emmer (improperly called Spelt) for the production of feed for farm stock. It will be seen from the results in the table that Emmer produced 724 pounds of grain per acre more than the Wild Goose, and 1,133 pounds per acre more than the Red Fife. The Emmer, which frequently goes under the name of Spelt, or Speltz, in this country, also surpassed the Wild Goose spring wheat in the average results of 39 tests conducted over Ontario in 1901 by an average of 450 pounds per acre. In threshing the Emmer, the heads break up into sections, and there is no separation of chaff and kernel. The threshed grain, therefore, contains an average of nearly 25 per cent. of chaff. The amount of chaff or hull on the Emmer is, therefore, about the same as the hull of oats, each averaging in the neighborhood of 25 per cent. of the grain, as threshed by our ordinary separators. The Wild Goose spring wheat is grown largely for export to France and Italy for the manufacture of maccaroni, and the price of this variety has been good within the past few years. The Red Fife is one of the largest although not exactly the heaviest yielder of the spring wheats grown at the College. It is, however, a grain of excellent milling quality, and, taking all things into consideration, it is as good a variety for bread production as we have in Ontario.

Buckwheat. There is not much difference in the yield of buckwheat for 1902, that from the Japanese being only 8 pounds per acre more than from the Silver Hull variety. In 1901 there was an average of 6.3 bushels per acre in favor of the Japanese, as compared with the Silver Hull.

Field Peas. In all, four varieties of peas were distributed for co-operative experiments in 1902. These were divided into two distinct experiments, one being with large yielding varieties, whch are subject to the attacks of the pea weevil (pea bug), and the other with varieties which are entirely proof against the attacks of the weevil. The two varieties of peas—Early Britain and Canadian Beauty—were distributed almost entirely in those districts of Northern Ontario which are as yet uninfested with the pea weevil. The average results of the twenty-six tests show that the Early Britain gave 1,166 pounds, and the Canadian Beauty, 1,032 pounds per acre. The Early Britain is a brown pea, imported from England, and is not quite as saleable as the Canadian Beauty. The latter named variety is a large, smooth, white pea, of good quality, and very saleable. For the other experiment, the Egyptian and Grass varieties, which are proof against the ravages of the weevil, were used. Owing to the very cool weather and prolonged and excessive rains of the past summer, these two varieties gave unusually poor results, each kind giving an average of less than 800 pounds per acre. Usually, however, the Grass peas give very good results. The straw is of medium length and of good quality, and the grain is usually good in point of yield, and when ground makes a rich meal for feeding to farm stock. The Egyptian pea requires very rich soil. It produces a poor quality of straw, but a very large yield of grain, which is of good quality.

Soy, Soja, or Japanese Beans. The Soy bean is a leguminous plant, native of Japan and China, and ranks very high in valuable food constituents. The plants grow upright, branch considerably, and frequently drop their leaves about the time the seed is ripe. The Soy beans are used for green fodder,

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silage, hay, pasture, and as a soil renovator. The grain, which is exceedingly rich, is used as a food for live stock. The beans have been used for the food of man since early times in Japan, and, more recently, in European countries. They are not generally used as a food by themselves, but are made into different complex forms, of which five are quite common among the Japanese people. Some of the leading varieties of Soy beans have now been distributed throughout Ontario for four years in succession for co-operative experiments, and the results have been quite satisfactory. In 1899 and 1900 the Medium Green, American Coffee Berry, and Extra Early Dwarf varieties were the three distributed. In 1901 and 1902 the Early Yellow and Medium Green varieties constituted the experiment. The Medium Green variety produced an average yield per acre of 22.4 bushels in 1899, 26.9 bushels in 1900, 18.1 bushels in 1901, and 20.2 bushels in 1902. In 1901 the Early Yellow produced a larger yield than the Medium Green, and in 1902 the opposite was the case. As a rule, the Early Yellow variety seems to be the best suited for most parts of Ontario for the production of grain, and the Medium Green for the production of fodder, either to be fed by itself or to be placed in the silo along with the corn to improve the nutritive value of the silage.

Corn for Grain. The two varieties of corn, from which we obtained twelve reports of carefully-conducted experiments, produced fairly high yields per acre in 1902. Although the Compton's Early produced 3,180 pounds of shelled grain, in comparison with 2,991 pounds produced by the King Phillip, still the King Phillip variety was more popular among the experimenters. In 1901 the King Phillip gave a larger yield of grain per acre than the Compton's Early in the average of nineteen tests. Owing to the exceedingly cold, wet summer, the North Star Yellow Dent, which gave very high results in each of the two years previous, did not ripen sufficiently well in many parts of Ontario to enable us to report the yield of grain for the past year.

Winter Wheat. The results of the co-operative experiments with winter wheat were reported as soon as possible after the crop was harvested. As the results appeared in many of the newspapers of the Province, the information was pretty generally distributed before the time of sowing wheat last autumn. Further comments are unnecessary at this time.

Root Crops.

Experiments.	Varieties.	Comparative value.	Yield of roots per acre (tons).
10. Mangels (11 tests)	Evans' Improved Mammoth Sawlog	79	31.1
	Carter's Warden Yellow Globe	100	30.7
	Carter's Champion Yallow Intermediate	74	27.9
11. Sugar beets (12 tests)	New Danish Improved	100	26.2
	Kleinwanzlebener	50	22.0
12. Swede turnips (2 tests)	Sutton's Magnum Bonum	100	20.8
	Kangaroo	67	19.5
	Hartley's Bronze Top	33	18.8
13. Kohl Rabi and fall turnips (1 test)	Greystone	100	24.2
	Cow Horn	100	22.0
	Early White Vienna Kohl Rabi	55	13.3
14. Parsnips and carrots (3 tests)	Bruce's Mammoth Intermediate Carrot	100	24.6
	Half Long White Carrot	88	18.4
	Improved Half Long Parsnip	50	17.2

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Mangels. For the experiment with mangels, three varieties which had given excellent results at the College, and which represented three different classes of mangels, were distributed. These classes were represented as follows: Long Red, by Evans' Improved Mammoth Sawlog; Intermediate, by Carter's Champion Yellow; and the Globe, by Carter's Warden Yellow. In the experiments conducted both at the College and throughout Ontario in 1902, the Globe mangels gave exceptionally good results. It will be seen from the report here presented that the Globe variety was surpassed by the Long Red by less than one-half a ton per acre. It will aslo be seen that the Globe variety was the most popular mangel among the experimenters in the co-operative work of the past year.

Sugar Beets for Feeding purposes. Previous to 1900, one variety of sugar beets was included in the experiment with mangels, but it was thought advisable in 1900 to make a distinct experiment with sugar beets, and, therefore, two varieties from among some thirteen different kinds which had been tested at the Agricultural College were selected for the co-operative test. For that year, the Danish Improved and the White Silesian were used, and the results show that the yield per acre from the two varieties was practically the same, but the Danish Improved was more popular than the White Silesian in the estimation of the experimenters. In 1901 and again in 1902, the Danish Improved and the Kliënwanzlebener were the two varieties included in the co-operative test. The Kleinwanzlebener is the variety which is very rich in sugar, and is the one which has been used in the tests over Ontario of agricultural beets to be analyzed for sugar purposes. It is also the one which is used almost entirely in the production of sugar beets for the different factories now manufacturing sugar in Ontario. The two varieties used for the Union experiment were grown from an agricultural standpoint. The roots were grown in rows 25 inches apart, and the plants were thinned to a distance of 10 inches apart in the rows. In the average in fifteen tests in 1901, the New Danish Improved gave 5 tons per acre more than the Kleinwanzlebener, and in the average of twelve tests in 1902 the New Danish Improved gave 4.2 tons per acre more than the Kleinwanzlebener variety. As the Kleinwanzlebener, however, gave an average 22.26 tons per acre in 1901, and exactly 22 tons per acre in 1902, these yields are very high for a sugar beet which has been bred particularly to produce a very high percentage of sugar.

Swede Turnips. The Sutton's Magnum Bonum turnip surpassed the Kangaroo variety in the co-operative tests of 1900, and also in those of 1902, although the Kangaroo variety gave an average of about three-quarters of a ton per acre more than the Sutton's Magnum Bonum in the tests for 1901. Both of these varieties have surpassed the Hartley's Bronze Top, which is a variety that has been noted for its high yield per acre.

Fall Turnips and Kohl Rabi. Along with the two varieties of fall turnips, one variety of Kohl Rabi was distributed in each of the past two years. The yield of Kohl Rabi, however, has been only about one-half of that of the best yielding variety of fall turnips in the results of each of these two years.

Field Carrots and Parsnips. The Bruce's Mammoth Intermediate Carrot was distributed in 1902 for the first time. It had made a high record in the experiments at the College, and it will be seen from the results that it has also kept up its high reputation throughout the Province, the average yield per acre of the co-operative tests conducted in 1902 being upwards of twenty-four tons of roots per acre. The parsnips, as in 1901, gave the lowest average yield of roots in 1902.

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Forage Fodder, Silage and Hay Crops.

Experiments.	Varieties.	Comparative value.	Yield of whole crop per acre (tons).
15. Fodder corn (4 tests)	Wisconsin's Earliest White Dent	100	17.5
	Mastadon Dent	63	14.8
	North Star Yellow Dent	100	13.0
16. Millet (2 tests)	Japanese Panicle	100	5.0
	Japanese Barnyard	86	4.9
	Hungarian	73	2.6
17. Sorghum (1 test)	Early Amber Sugar Cane	100	15.8
	Kaffir Corn	65	10.6
	Millo Maize	43	7.0
18. Grass peas and vetches (2 tests).	Hairy Vetches	100	4.7
	Common Vetches	67	2.8
	Grass Pea	50	2.4
19. Rape and kale (2 tests)	Dwarf Essex Rape	100	21.9
	Thousand Headed Kale	43	13.7

Experiments.	Varieties.	Average height about six months after seeding. Inches.	Second year's crop. Tons of dry hay per acre.
		4 tests.	9 tests.
20. Clover	Mammoth Red	7.0	4.0
	Alsike	5.3	2.6
	Common Red	6.0	2.1
		6 tests.	1 test.
21. Perennial crops	Lucerne	7.1	4.4
	Sainfoin	5.7	1.9
	Burnet	7.5	1.4
		4 tests.	7 tests.
22. Grasses	Tall Oat	20.5	2.8
	Timothy	4.0	2.7
	Meadow Fescue	.....	2.2
	Orchard	9.3	1.9
	Awnless Brome	8.8	.....
	Tall Fescue	17 5	.....

Fodder Corn. The Wisconsin Earliest White Dent corn, which gave the largest total crop per acre in the co-operative experiments for 1902, is a very excellent variety of corn for silo purposes. It can be successfully grown in the southern and central parts of Ontario, but is rather late for the northern districts. In the average results of growing sixty-seven varieties of corn at the College for five years in succession, the Wisconsin Earliest White Dent produced the highest yield of ears per acre. The large total crop which is, therefore, produced by this variety is of good quality. This is the variety which is grown on the College farm more extensively than any other for silage purposes. The North Star Yellow Dent is an earlier variety, well suited for the production of grain in Southern Ontario, and for using for fodder or for silage purposes in Northern Ontario. The Mastadon Dent variety usually yields much better than it did in 1902. It is the latest variety of the three, and is only suitable to grow on the warm soils in the southern part of the Province.

Millet. For five years in succession the Japanese Panicle, Japanese Barnyard, and Hungarian Grass have been used in the co-operative experiments. In each of these years the Japanese Panicle variety headed the list, except in 1900, when the Japanese Barnyard variety produced an equal amount. In each of the five years the Hungarian Grass has given the lowest yield per

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acre. In the average of the four years previous to 1902 the yields were as follows: Japanese Panicle, 8 tons; Japanese Barnyard, 7.6 tons; and Hungarian Grass 5.3 tons. It will, therefore, be seen that the results of all the varieties are much lower in 1902 than in the average of the four years previous. This is undoubtedly due to the peculiar weather conditions of the past season.

Sorghum. Although a large number of varieties of sorghum have been under experiment for several years at the Agricultural College, no co-operative experiment was conducted with different varieties of sorghum until 1902. In each of the two years in which these three varieties have been tested throughout Ontario, the Early Amber Sugar Cane produced the largest, and the Kaffir Corn the smallest yield of green corn per acre. The Early Amber Sugar Cane was decidedly the most popular among the experimenters in each of the past two years.

Grass Peas and Vetches. For four years in succession Hairy Vetches, Common Vetches and Grass Peas have been tested for fodder purposes in connection with the Experimental Union. In each of these years the Hairy Vetch has kept the first place in yield of green crop per acre, the average number of tons produced in each of the years being as follows: 1899, 9 tons; 1900, 8.6 tons; 1901, 7.1 tons; and 1902, 4.7 tons. It will be seen, therefore, that the yield for the past year is much lighter than the yield for any of the other years in which this crop was grown. There has not been much difference in the yield per acre produced by the Grass peas and the Common Vetches. The results for both of these were exceedingly low in the past year.

Rape and Kale. Throughout Ontario, as well as at the College, Dwarf Essex Rape is the variety which has given the greatest yield of fodder per acre of all the varieties belonging to this class which have been tested for several years in succcession.

Clover. The average results for the clover as given in the table here presented is for the first crop in each year. The second crop of clover is not included. As the result of experiments conducted at the College for several years, we find that the Common Red clover usually produces a little larger yield than the Mammoth Red or the Alsike, when both crops, which are produced in the same season, are taken into consideration. The second crop in the same season of the Common Red is much greater than that of either of the other varieties.

Sainfoin, Lucerne, and Mammoth Red Clover. This experiment has only been started for three years, and, as these crops are perennial in their character, we hope to obtain fuller information regarding their comparative value after the plots have been standing for a greater length of time.

Grasses. The results here presented are for the second, third and fourth year after the seed had been sown, and they represent simply the first cutting in each season. The Awnless Brome Grass was not included in this experiment. Awnless Brome Grass has been introduced in this experiment recently. The Meadow Fescue, which was formerly distributed as one of the varieties for the co-operative tests, has been dropped, and the Tall Fescue has taken its place.

Field Beans. The Medium or Navy variety of field beans, which occupied first place in yield per acre in 1902, with an average of 30.5 bushels, also gave good results in each of the three years previous. The average yield per acre for the Medium or Navy in 1899 was 21.3 bushels; in 1900, 21.8 bushels; and in 1901, 25.5 bushels. It occupied first place in yield per acre among the varieties tested in each of the years 1899,1900, and 1902, and second place in 1901.

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Culinary Crops.

Experiment.	Varieties of Beans.	Comparative Value.	Yield per Acre.	
			Straw (tons.)	Grain (bus.)
23. Beans (5 tests)	Medium or Navy	100	.7	30.5
	California Pea Bean	50	.9	23.1
	Marrowfat	50	.9	23.7

Experiment.	Varieties of Sweet Corn.	Table Quality.	Comparative number of ears.	Number of days until ready for table use.
24. Sweet Corn (10 tests)	Mammoth White Cory	69	73	97
	Country Gentleman	100	100	120
	Kendal's Early Giant	75	87	95

Sweet Corn. It will be seen from the figures here presented that the Country Gentleman variety of corn produced the greatest number of ears, and the corn was of the best quality for table use of the three varieties under experiment. This variety, however, was much later than either the Kendal's Early Giant or the Mammoth White Cory, both of which were ready for use fully three weeks earlier than the Country Gentleman. The corn of the Mammoth White Cory variety was considerably inferior to that of either of the other varieties for table use.

Fertilizer Experiments.

Fertilizer.	Quantity per Acre Fertilizer used.	Average Yield per Acre.						
		Bushels of Oats per acre, 5 years, 74 tests.	Tons of Mangels per acre, 5 years, 41 tests.	Tons of Swede Turnips, per acre, 1902 2 tests.	Corn per acre.			
					Total Crop (tons)		Ears (tons)	
					1902 3 tests.	Average 6 years, 43 tests.	1902 3 tests.	Average 6 years, 38 tests.
	lbs.							
No. Fertilizer	none	38.9	20 6	22.7	9.2	8.3	2.0	2.8
Nitrate of Soda	160.0	46.3	26.5	25.7	12.6	9.7	2.5	3.2
Muriate of Potash	160 0	43.8	24.6	23.4	13.2	9.8	2.1	3.1
Superphosphate	320.0	43.6	24 2	27.1	11.9	9.4	2.8	3.2
Mixed Fertilizer	213.3	48.7	25.4	29.4	12.2	9.6	2.9	3.3

The superphosphate and the muriate of potash were applied to the land at the time of planting, and the nitrate of soda at the time when the plants were about three inches high. The mixed fertilizer consisted of one part of nitrate of soda, one part of muriate of potash and two parts of superphosphate by weight.

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In the average results of co-operative experiments conducted throughout Ontario for a number of years, it will be seen that the greatest yields were produced by the mixed fertilizer with oats, the nitrate of soda with mangels, the mixed fertilizer with turnips, the muriate of potash with corn for fodder, and the mixed fertilizer with corn for grain. The fertilizers seemed to exert a greater influence with both the mangels and the swede turnips than they did with either corn or oats. In the average of five years' results, the nitrate of soda increased the yield of turnips about six tons per acre, and in the average of one year's results, the mixed fertilizer increased the yield of turnips nearly seven tons per acre. The figures here presented show the average influence of the fertilizers for the first season after their application. The experiments with turnips and with corn will likely be repeated in 1903. The results of these experiments are worthy of careful study :

POTATO EXPERIMENTS.

Experiment.	Potatoes.	Comparative value.	Yield of whole crop per acre bus.
26. Early Varieties (126 tests)	Rose of the North	72	197.5
	Early Dominion	85	189.8
	Burpees' Extra Early	98	189.6
	Stray Beauty	56	188.4
	Early Ohio	72	182.6
	Early Pinkeye	100	169.0
	Ohio Junior	62	90.8
27. Methods of Cultivation (19 tests)	Grown on the Level	98	197.1
	Grown in Hills	100	193.3
28. Preparation of Seed (10 tests)	Potatoes not coated with land plaster	100	157.2
	Potatoes coated with land plaster.	100	156.9

Varieties of Early Potatoes. It will be observed that the four varieties which stand highest on the list gave average yields per acre which did not vary 10 bushels per acre between the highest and the lowest. Although the Rose of the North produced the greatest number of busels per acre, the Early Pink Eye was an exceedingly popular potato among the experimenters. The Burpee's Extra Early was a close competitor with the Early Pink Eye in the popularity of the varieties throughout Ontario. The Stray Beauty and the Early Ohio were the least popular of the seven varieties distributed in 1902.

Growing Potatoes on the Level and in Hills. For two years in succession a co-operative experiment to test the comparative results from growing potatoes on the level and in hills has been conducted throughout Ontario. In the average results of forty-five tests conducted in 1901 the level cultivation gave a yield of 197.8 bushels, and the hill cultivation a yield of 189.3 bushels per acre. It will, therefore, be seen that the level land produced 8.5 bushels per acre in 1901, and 4.8 bushels per acre in 1902 more than the land which was carefully hilled up. In the experiments at the College, we have also found that the level cultivation has produced the greatest yield of potatoes per acre.

Planting Cut Potatoes which have and which have not been Coated over with Land Plaster. This experiment has now been continued throughout Ontario for three years in succession. The average results show that the potatoes which were sprinkled with land plaster gave an increase of 16.4 bushels per acre in 1900, of 14.4 bushels per acre in 1901, and of one-third of

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a bushel per acre in 1902 over those on which no plaster was used. The reason that the yields for 1902 are so nearly alike may probably be due to the peculiar weather conditions of the past summer. This experiment has also been conducted for several years at the Agricultural College. It is found in the College experiments that cut potatoes which were coated with land plaster gave better results than those on which no land plaster was used.

Q.: In mixing oats and barley, what variety of oats would you recommend—Alaska or Daubeney ?

A.: We sent out Daubeney last year, and I think it gave a little the better result.

Q.: Do I understand you to recommend using Alaska oats with barley ?

A.: If you have a very large yielding variety of barley, and you want to grow a mixture, then you will have to grow a very early variety of oats, and I think Daubeney is one of the best of the very early varieties.

Q.: Does it make any difference if the barley is ripened before the oats ?

A.: Yes ; you will be apt to lose some of the barley.

Q.: How would it do to use a later barley ?

A.: It would be all right. To do that, you would have to use a very late variety of barley, like Chevalier Two-rowed, mixed with Siberian or Banner oats. I think this would make a better mixture than the one previously mentioned.

Q.: In what proportion would you mix them ?

A.: One bushel of oats to one and one-half bushels of barley.

Q.: How much more would you get off two acres using mixed grain than by growing the two varieties separately, one acre of each ?

A.: About 200 pounds.

Q.: What is the meaning of the "comparative value" column.

A.: It gives the average of the opinions of the different experimenters.

Q.: Do you think that the Red Fife wheat is improving in yield at all ?

A.: I fancy it is. We find it one of the best yielding varieties we have. It is not equal to the Wild Goose in yield, but that variety is not much good for flour production.

Q.: Would you recommend mixing Emmer and Wild Goose with barley and oats ?

A.: This is the first year we have grown Emmer in a mixture, and have not yet worked out the results. We have grown Wild Goose with barley and oats, but found that barley and oats gave a little larger yield.

Q.: What would be the feeding value of Emmer ?

A.: I think it would be a little richer and contain a little more gluten than any other spring wheat variety we have, unless it would be Wild Goose.

Q.: Is the Egyptian a real pea ?

Mr. Peart: In regard to the grass pea, my experience was that this year was very favorable to it, and that it made a remarkable growth. Ordinary, peas have been exterminated with the weevil in our section, and we have been growing the grass pea. Last spring we had four acres. I mix a bushel and a half of grass peas with half a bushel of oats. At the end of August the peas were from three to four feet in length, and there were blossoms at the ends of the vines and ripe pods at the bottom. There was an immense crop, and I obtained a net yield of 40 bushels per acre. My locality is Burlington.

A Member : It has been giving very good results in the Burlington and Hamilton districts.

Q.: Do you sow the Soy beans in rows ?

A.: Yes.

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Q.: How far apart ?

A.: Twenty-five to twenty-eight inches.

Q.: Which of the varieties of winter wheat stood the winter best ?

A.: Dawson's Golden Chaff stands the winter well ; in fact, they all do. If they did not, they would not be selected as the five best varieties among about 1 0 varieties. We found that the early Genesee Giant beat all varieties in standing the winter. Dawson's Golden Chaff came tenth on the list, when the winter was very severe two years ago.

Q.: Have you tried the Arcadia ?

A.: This year it went down badly, and I notice that of all the varieties we had this year, it sprouted most. It is a white wheat and rather soft.

Q.: Which variety of these five sprouted most ?

A.: Early Genesee Giant ; possibly Dawson's next.

Q.: How much more will millers pay for Turkey Red than for Golden Chaff ?

A.: From five to ten cents per bushel.

Q.: Is it a usual thing for Carter's Intermediate to stand above the Globe ?

A.: Taking our own results here for a good many years, we find that we get an average of 25 tons per acre from the best Long Red mangel, and between 23 and 24 tons from the best Intermediate; about 17 tons per acre from the best Globe, and about 19 tons per acre from the largest yielding variety of sugar beets.

Q.: Would the feeding value of the sugar beet be equivalent to the sugar contents ?

A.: I do not think so. We grew mangels and sugar beets in our experimental grounds for two summers. Prof. Day fed them to milch cows for two winters and compared them. The mangels would contain 4 or 5 per cent. sugar, and the sugar beets, say, 10 per cent. He found he got almost exactly the same amount of milk of the same quality from mangels as from sugar beets, using equal quantities of each.

Prof. Day: Had it been for fattening, I think the sugar beets might have come out ahead, but for milk production the sugar had no perceptible value.

Mr. Zavitz : I do not think that the value of the beet for feeding is determined wholly by its sugar content.

Q.: Beets rich in sugar would make a better food for hogs ?

A.: Yes ; hogs are very fond of them. I am not able to give the values in feeding experiments, however.

Q.: Have you conducted experiments with grass peas grown in the fall ?

A.: No.

Q : They came up by accident in our pasture last fall and gave favorable results.

A.: Last winter was a favorable winter, and it might not be wise to judge from that altogether.

Mr. Zavitz : The Hairy Vetch has been tried by Mr. Tweddle as a cover crop, and has proved a great success.

Q.: How much seed does the crop produce ?

A.: With Mr. Tweddle about eight or nine bushels per acre. The drawback at present is the price of the seed, which is about five dollars per bushel, and comes from Germany. I think that when we can raise our own seed it will be a very popular variety in Southern Ontario.

Mr. Zavitz : If you intend to grow rape, be sure to ask for Dwarf Essex Rape, or you will get some variety that will be worse than mustard on your land.

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Q.: Does rape winter here ?

A. If the roots are left in the ground a good many will come through a moderate winter.

Q.: Does Sainfoin grow on sandy land in Germany ?

A.: Yes ; principally on sandy land. They have a good deal of such land there ; but it does not answer to grow it on too light soil.

Q.: How do stock like the Tall Oat grass ?

A.: Not quite as well as some of the others ; it is a little bitter.

Q.: How would Country Gentleman compare with Stowell's Evergreen ?

A.: Both varieties of sweet corn are excellent.

Q.: Which would come the earliest ?

A.: I do not think there is very much difference.

Q.: Have you ever tried Black Mexican ?

A.: We sent it out two years ago, and it gave very good satisfaction. It is one of the three best sweet corns ; but it does not work in very well in co-operative work because of its color.

Q.: What shape was the soil in before you applied the fertilizer ?

A.: We asked the experimenters to take as nearly as they could the average soil of their farms.

Q.: How are the fertilizers applied ?

A.: They are in all cases sown broadcast and worked into the surface soil.

Q.: What do they cost ?

A.: From $4 to $4.50 per acre.

Q.: Were the unfertilized plots manured in the ordinary way, or were they entirely without manure ?

A.: They received no manure whatever.

Q.: Have you found that fertilizers pay with root crops ?

A.: I think they would pay very well with mangels. There is an increase of six tons of roots per acre using $4.50 worth of fertilizers.

Q.: You recommend using the nitrate after the plants are up ; how do you do when it is mixed ?

A.: We sow it just the same, withholding the nitrate of soda until the crops are up two or three inches in height. The reason for this is that it is very soluble, and you lose it if applied before the plants are ready to take it up.

Mr. G. H. Clark, Ottawa : I judged at the exhibitions at St. Johns and Charlottetown last fall, and was surprised at the fine display of root crops and potatoes. In most cases fertilizers had been used. I had a talk with one of the largest growers of potatoes, who said he used fertilizers to the extent of five dollars per acre, which he said paid him. The growers all said they got very much better results from the use of fertilizers.

Mr. Zavitz : We have been conducting experiments with potatoes for seven or eight years and fertilizing them. The best fertilizer we have used out of thirteen has increased the crop about 42 bushels per acre in the average of some eight years. We find that so far fertilizers seem to give the most marked results, first with roots, next with potatoes, and then with corn.

Q.: What does it cost per acre to fertilize potatoes ?

A : I think about $3.50.

Q.: Do you plow them in level cultivation ?

A.: We simply direct our experimenters to plant three or four inches below the level.

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REPORT ON CO-OPERATIVE EXPERIMENTS WITH SMALL FRUITS.

By Prof. H. L. Hutt, Ontario Agricultural College, Guelph.

For the benefit of those who may not be familiar with the work of the Experimental Union, I will briefly outline the plan of conducting the co-operative tests made with small fruits:

Early in the spring a circular letter is sent out offering for co-operative testing four of the leading varieties of each of the different kinds of small fruits. The plants are furnished in the order in which the applications are received until the supply is exhausted. Accompanying each lot of plants, carefully prepared instructions are sent, giving directions for caring for the plants and for conducting the experiment. Everything is sent free of charge, the only stipulation being that the experimenter agrees to conduct the experiment according to the directions furnished, and to report as requested at the end of each season.

At the end of each season blank forms are sent to the experimenters upon which to report the growth and yield of the plants.

The Extent and Progress of the Work.

This co-operative testing of small fruits was begun nine years ago, with 60 experimenters. Every year since then the number has been steadily increasing, until over 1,200 experimenters have engaged in the work; 230 new experimenters were added to the list this year. At first these tests were confined to about half a dozen counties, but now they have found their way into every county and district in the Province, and it is interesting in this connection to note that they are being most eagerly sought for by those northern sections where attention to the cultivation of fruits is most needed. The half dozen counties which have sent in the most reports this fall are: Grey, Simcoe, Bruce, Ontario, Muskoka, and Parry Sound.

Plant Distribution.

The following circular gives the list of plants offered to experimenters last spring, and other information regarding their distribution:

Dear Sir,—Through the agency of the Experimental Union, arrangements have again been made for furnishing plants for a number of co-operative experiments with small fruits.

The varieties for the several experiments offered this year are as follows:

1. Strawberries—Clyde, Tennessee Prolific, Saunders, and Van Deman—12 plants of each.
2. Raspberries—Cuthbert, Golden Queen, Marlboro', and Columbian—6 plants of each.
3. Black Raspberries—Gregg, Kansas, Palmer, and Souhegan—6 plants of each.
4. Blackberries—Agawam, Gainor, Kittatinny, and Snyder—6 plants of each.
5. Currants—Fay, Raby Castle, Victoria, and White Grape—3 plants of each.
6. Gooseberries—Downing, Pearl, Red Jacket, and Whitesmith—2 plants of each.

Each person wishing to join in the work, may do so by choosing one of the experiments, and signing the agreement contained in the accompanying form of application. The experiment selected may be indicated by number. It is well for each applicant to make a second choice, in case he may be too late for the first. The supply being limited, plants will be furnished in the order in which the applications are received; those who apply promptly will be most likely to receive what is asked for.

Instructions for conducting the test will be sent to each experimenter before the plants are mailed, and blank forms will be furnished from year to year, upon which to report the results. All will be furnished free of charge, and the plants and produce become the property of the experimenter. In return, we expect that each experimenter will follow the instructions given, and will report each year, as requested, upon the growth and yield of each variety under test.

These plants are purchased from nurserymen at considerable expense, and as the funds at our disposal for this purpose are limited, we can seldom furnish plants to more than half of those applying for them. We would like, therefore, that they go to those only who will make an honest effort to make the experiment a success, and we trust no one will apply for plants unless he is prepared to make such an effort, and will report the results as requested.

Trusting that your interest in the work may lead you to become a successful experimenter.

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From a perusal of the list given above, it will be seen that it contains nearly all of the small fruits which should be grown in every farmer's garden. The varieties mentioned are those which have been found by repeated tests at the College, and at the Ontario Fruit Experiment Stations, to be among the best to cover the season from early to late; and the number of plants of each variety is just sufficient to make a fair comparison of varieties, and give the grower a start if he wishes to propagate more for himself.

Some idea of the extent of the distribution, and the way these small numbers count up, may be gleaned from the fact that during the past nine years we have distributed to experimenters 2,832 currant bushes, 3,596 gooseberry bushes, 4,368 blackberry bushes, 5,592 red and white raspberry bushes, 5,688 black raspberry bushes, and 31,872 strawberry plants, thus making a total of 53,948 plants.

Applications for Plants.

The following form of application, which is sent with the circular offering plants for testing, states the terms upon which the plants will be sent. When filled in, it is, in reality, an agreement on the part of the experimenter to follow the directions given and to report the results :

Dear Sir,—Kindly report below on the plants sent to you for co-operative testing in the year.....
The first year's report upon the growth of the plants should be sent in before September 1st. Reports in following years upon the fruiting should be sent in as soon as possible after the fruit is picked.

Varieties.	No. Planted.	No. Lived.	Yield (in oz.)	Vigor of Growth.

Remarks .....

Name of experimenter.....

P. O.... ..... County.....

(This sheet when filled out and returned by mail, will require 2c postage whether the envelope is sealed or not.)

General Directions for Experiments.

After the applications are received, and as soon as the list of those to whom plants are to be sent can be made up, the following circular is sent out informing the applicants that they may expect the plants, and giving general directions for the conducting of the experiment :

Dear Sir,—I am pleased to inform you that your application for plants for co-operative testing was duly received, and that the plants will be forwarded to you as soon as the weather is suitable for planting. If they cannot be planted as soon as they are received, they should be unpacked, so that the roots may be spread out and buried in moist earth ; but the sooner they can be permanently planted, the better.

The soil upon which they are to be planted should be as uniform as possible, so that all varieties may have an equal chance.

As soon as planted, each variety should be carefully labelled. Stout wooden stakes, painted white, written on plainly with a lead pencil, and driven firmly into the ground answer the purpose well. It is advisable, also, to make a record of the planting in a note-book, in case a label should at any time be lost.

I trust you will follow the directions carefully, and that you will not allow poultry or trespassers to interfere with the fruit. The weight of the entire crop from each variety is one of the most important items desired in your annual report ; and, in order that this may be given accurately, it will be necessary for you to carefully weigh and record each picking, so that the total yield of each variety may be reported

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at the end of each season. Blank forms will be mailed to you in due time each season, upon which to make such report.

The value of this experiment depends largely upon the attention given to it. I trust you will find it both interesting and profitable. From this small collection of plants you may, in time, by good management, propagate for yourself all the plants you wish, without interfering with the value of the experiment in the least.

Should you require any further information regarding the work, kindly let me know, and I shall be pleased to give all the assistance possible.

In addition to the general directions, special cultural directions are also sent for the particular kind of fruit chosen. These cultural directions are here given in connection with each experiment:

THE STRAWBERRY EXPERIMENT.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of barnyard manure.

2. Set the plants in rows at least 4 ft. apart and about 18 inches apart in the row. If two or more varieties are planted in the same row, leave a space of at least 3 ft. between them to avoid mixing of the runners.

3. The best method of planting is to use the spade, thrusting it deeply into the ground, then pressing it backwards and forwards. Into the opening thus made, spread out the roots fan shaped, and pack the soil firmly about them with the foot.

4. Give clean, thorough cultivation throughout the season, and never allow the soil to become crusted.

5. Pinch off all blossoms the first season, that the plants may make vigorous growth and not waste their energies trying to produce fruit.

6. Confine the runners of each variety to its own row allowing them to form matted rows about a foot and a half wide. If any of the plants should die, place the runners of the adjoining plants so that they will fill up the spaces.

7. As soon as the ground is frozen in the fall, cover the whole plantation with two or three inches of strawy stable manure. When danger of frost is over in the spring, rake the coarsest of this covering off the plants and tread it down between the rows for a mulch. If it is not thick enough to keep down weeds and retain moisture, more may be added at any time in the spring.

8. To continue the experiment from year to year, a similar plantation should be set out each spring, taking a dozen new plants of each variety from the plots set out the year before. The old plots may be plowed up after the second crop is off.

9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season is over.

The varieties of strawberries sent out last spring were Clyde, Tennessee Prolific, Saunders and Van Deman. These were sent to 143 experimenters, 101 of whom have reported this fall upon the growth of the plants. The majority report from 50 per cent. to 70 per cent. of the plants living. This is a much better showing than usual, no doubt due to the favorable season for planting.

The varieties sent out last year were Clyde, Haverland, Saunders, and Van Deman. Thirty-two experimenters reported upon their fruiting this year. Clyde in most places has ranked as the heaviest yielder; Van Deman as the earliest; and Saunders as the latest. These four varieties are none too many for any collection, whether for home use of market, and they give a long season of fruiting.

Early last spring the following letter was sent to all the experimenters who had received plants the year before, requesting them to continue the experiment by setting out a new plantation, with plants of their own growing:

DEAR SIR:—As you are one of our co-operative experimenters who received strawberry plants last spring, I take this opportunity of requesting that, if possible, you will continue this experiment by setting out a new plantation this spring, taking a dozen young plants of each variety from the plots set out last year.

I make this request, because our experience has shown that good home-grown plants are always more satisfactory than those obtained from a distance. If, then, you can set out a new plantation with plants of your own growing, you may reasonably look for much better results than from the plants obtained from us.

If any of the varieties have not lived, or have failed to make enough plants, you will of course be unable to conduct the experiment in full. Nevertheless, you will find it to your advantage to set out new plots of the varieties you have.

In making a new plantation, the same general directions, as given last year, should be followed.

Should you require any further information regarding the work, kindly let me know and I shall be pleased to give all the assistance possible.

Yours truly,

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We have not as yet ascertained how many have complied with this request, but we are quite certain that all who have done so will obtain much more satisfactory results than were obtained from the original planting.

The Red Raspberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure
2. Plant in rows 5 or 6 feet apart, with plants 5 feet apart in the row.
3. Give clean, thorough cultivation until about the beginning of August, and never allow the soil to become crusted.
4. Pinch off any blossoms which may form the first year, that the plants may not waste their energies trying to produce fruit.
5. Do not allow the varieties to become mixed by letting the suckers grow between the bushes.
6. In the fall, or early in the spring, cut out all old canes that have fruited, and leave about six of the strongest new canes to each bush. Shorten the ends of these to a uniform height, making the bushes uniform and symmetrical.
7. In northern localities, where winter protection is needed, bend down the canes late in the fall and cover the tops with earth to keep them under the snow.
8. Should any spaces have to be filled, or should the experimenter wish to increase his stock of any of the varieties, it may readily be done by taking up the young suckers which spring up about the bushes. Shaffer is propagated by bending down and covering the tips of the new canes in August. They will make good plants by the next spring.
9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

The varieties sent out for this experiment this year were Cuthbert, Golden Queen, Marlboro' and Columbian.

Thirty-eight out of the forty-eight experimenters to whom they were sent reported this fall upon the growth of the plants, and nearly all report that most of the plants have lived and made good growth.

The varieties sent out for the experiment in previous years were: Cuthbert, Golden Queen, Marlboro, and Shaffer. The Columbian was substituted for Shaffer this year, because it has proved, in our experiments here, to be much more hardy, and in all other respects, quite as good a berry.

These four varieties are also well worthy of a place in any home or market garden. Marlboro' is conceded to be the leading early variety. Cuthbert is still the favorite among the bright red varieties, and Golden Queen among the yellow varieties. Shaffer, a large, late, purple-fruited variety, has proved with nearly all experimenters to be the heaviest yielder of the lot.

The Black Raspberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Plant in rows 5 or 6 feet apart, with plants 5 feet apart in the row.
3. Give clean, thorough cultivation until about the beginning of August, and never allow the soil to become crusted.
4. Pinch off any blossoms which may form the first year, that the plants may not waste their energies trying to produce fruit.
5. To make the bushes stout and stocky, pinch off the ends of the new canes during the early summer, when they are two or three feet high.
(In northern localities, where winter protection is needed, this should not be done, as the canes should grow long and slender, that they may be more easily laid down.)
6. In the fall, or early in the spring, cut out all old canes that have fruited, and leave about six of the strongest new canes to each bush. Shorten the ends of these to a uniform height, making the bushes uniform and symmetrical.
7. In northern localities, where winter protection is needed, bend down the canes late in the fall, and cover the tops with earth to keep them under the snow.
8. Should any spaces have to be filled, or should the experimenter wish to increase his stock of any of the varieties, it may readily be done by propagating new plants from the tips of the new canes, which should be bent down and covered with earth in August. They will make good plants by the next spring.
9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

The varieties sent out this year for this experiment were:—Gregg, Kansas, Palmer and Souhegan. Fifty-two experimenters selected this experiment, one-half of whom reported this fall upon the results of their planting. The majority report rather poor success, as in many cases nearly half of the plants have failed. These raspberries are all propagated from tip-layers, and, because of their soft roots, are very liable to suffer during transportation

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in the mails. But, as with the strawberries, if the grower succeeds in getting half of the plants to live, he can soon propagate for himself all he requires.

In previous years, the varieties sent out were Gregg, Hilborn, Palmer, and Souhegan. Of these, the Hilborn has proved, on the whole, to be the most productive; although in southern parts of the Province, where it is not so subject to winter killing, the Gregg is the favorite variety, not only because of its productiveness, but because of its large fine fruit.

The Blackberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure
2. Plant in rows 5 or 6 feet apart, with plants 5 feet apart in the row.
3. Give clean, thorough cultivation until about the beginning of August, and never allow the soil to become crusted.
4. Pinch off any blossoms which may form the first year, that the plants may not waste their energies trying to produce fruit.
5. To make the bushes stout and stocky, pinch off the ends of the new canes during the early summer, when they are two or three feet high.

(In northern localities, where winter protection is needed, this should not be done, as the canes should grow long and slender, that they may be more easily laid down.

6. In the fall, or early in the spring, cut out all old canes that have fruited, and leave about six of the strongest new canes to each bush. Shorten the ends of these to a uniform height, making the bushes uniform and symmetrical.
7. In northern localities, where winter protection is needed, bend down the canes late in the fall, and cover the tops with earth to keep them under the snow.
8. Should any spaces have to be filled, or should the experimenter wish to increase his stock of any of the varieties, it may readily be done by taking up the young suckers which spring up about the bushes.
9. Carefully weigh and record the weight of each picking from each variety, and report as soon as possible after the fruiting season.

The varieties sent out last spring were: Western Triumph, Gainor, Kittatinny, and Snyder.

Thirty-two lots were distributed, and twenty-six of those securing them have reported this fall. The majority report fairly good success in planting.

Blackberries are much less hardy than red or black raspberries, and the results with them in northern sections have often been disappointing. Snyder has proved one of the hardiest, and has on the whole given the best results; but in the southern sections where the plants are not so subject to winter killing, the Kittatinny is the favorite variety.

The Currant Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Set plants five feet apart each way, in one or more rows, as convenient.
3. Give clean, thorough cultivation until about the first of August, and never allow the soil to become crusted.
4. Look out for currant worms on the lower parts of the bushes soon after the leaves are fully grown. They may be destroyed by spraying with Hellebore (1 oz. to 8 gallons of water), or Paris green (1 oz. to 10 gallons of water).
5. Prune early every spring. A good method of pruning is to leave six branches to form the bush, then keep up a renewal of new wood by cutting out, every year, two of the oldest branches, and allowing two strong new ones to take their place. Cut out all other new canes, and shorten back the new wood left nearly one-half.
6. Carefully weigh and record the weight of the crop from each variety, and report as soon as possible after the fruiting season.

The varieties of currants sent out were: Fay, Raby Castle, Victoria, and White Grape. Forty-eight lots were distributed, and thirty-eight experimenters reported this fall on the success of their planting. Nearly all reported all plants living and making good growth.

Fifty-two reports have been received upon plants sent out in previous years. Victoria has given the largest yield, followed closely by Raby Castle.

The Fay, however, is much thought of because of its large fine berries.

The White Grape currant is one of the best white currants, and in our tests at the College it has far out-yielded all other varieties.

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The Gooseberry Experiment.

1. Prepare the land deeply and thoroughly, working in, if necessary, a liberal application of manure.
2. Set plants five feet apart each way, in one or more rows, as convenient.
3. Give clean, thorough cultivation until about the first of August, and never allow the soil to become crusted.
4. Look out for currant worms on the lower parts of the bushes soon after the leaves are fully grown. They may be destroyed by spraying with Hellebore (1 oz. to 3 gallons of water), or Paris green (1 oz. to 10 gallons of water.
5. The English varieties—Industry and Whitesmith—are subject to mildew. This may to a great extent be prevented by spraying with potassium sulphide (1 oz. in 2 or 3 gallons of water). It should be applied early in the season, just as the buds are swelling, and five or six times afterwards, at intervals of ten days or two weeks.
6. Prune early every spring. A good method of pruning is to leave six branches to form the bush, then keep up a renewal of new wood by cutting out, every year, two of the oldest branches, and allowing two strong new ones to take their place. Cut out all other new canes, and shorten back the new wood left nearly one-half.
7. Carefully weigh and record the weight of the crop from each variety, and report as soon as possible after the fruit.

The varieties sent out for this experiment were: Downing, Pearl, Red Jacket and Whitesmith. Forty-seven lots were sent out this spring, and thirty-three experimenters have reported this fall upon their planting. There was some difficulty this year in getting plants of the Red Jacket, and they were not sent out as early as the others, but on the whole the experimenters have had good success with their planting.

Forty-seven experimenters reported on the plants sent out in previous years. Pearl and Downing, the American varieties, lead for productiveness in the order mentioned. Whitesmith, an English variety, gives the largest, finest berries, but is subject to attacks of mildew, from which the other varieties are exempt.

Valuable Features of the Work.

1. Through the plants distributed, many get a start in the growing of small fruits, who probably would have never made a start otherwise.

2. The concise cultural directions sent out with each lot of plants enable beginners to adopt the right mehods of culture from the beginning.

3. The varieties distributed are those which have been found by repeated tests at the College, to be most likely to prove satisfactory with the experimenter.

4. From the plants sent out, each experimenter may soon propagate for himself, enough plants to set out a large plantation.

5. The experience and information gained in properly planting, cultivating, cropping, weighing, recording, and reporting the results, with one of these simple tests, is an education which is of value to anyone, young or old.

Q.: How far north will the Kittatinny grow?

A.: It is only half hardy here. The Snider is a much hardier variety, but the Kittatinny is of finer quality and is preferred in the southern section where it succeeds well.

Q.: Have you noticed much difference in the soil for producing a good berry?

A.: The blackberry should have a well drained, warm soil.

Q.: Mire generally grow best on sandy soil.

A.: Yes, they will not stand wet or cold soil.

O.: Are currant worms as bad on newer ground?

A. No; they often take a year or two to spread from one patch to another if the plantations are some little distance apart, but the currant worm is so easily killed by spraying, that there is very little trouble in keeping it in check in any plantation. Spray from the underside of the bush early in the season, when a little spraying will do the work very effectively.

Mr. Hutt: The White Grape Currant is one of the best varieties for

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home use. It is a very heavy yielder, but is not so much desired in the market as the red varieties. We find that it will give a larger yield than the best of either the red or the black varieties.

Q.: What is the best time of the year to prune currants ?

A.: The currant is very hardy, and may be pruned any time after the leaves are off. If it is left till spring, it ought to be done early because the leaves start very early.

Q.: Will not the same principle in pruning apply to the black currant as to other currants ?

A.: Yes, very much; we give practically the same directions for the pruning of both.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN TREATING SMUT IN OATS, 1902.

By Prof. Wm. Lochhead, Agricultural College, Guelph.

The smut of oats has for many years done much injury to our oat crop, the loss by which may run into the hundreds of thousands of dollars. This smut, along with the other smuts of wheat, barley, and corn, are parasitic plants belonging to the group known as fungi. A smut fungus consists of two stages: the vegetative stage, and the reproductive, or spore stage. The vegetative stage has to do with the spreading of the fungus within the host, and the gathering of the food for its development from the tissues of the host. It consists of a large number of minute threads, called the mycelium. These push their way between, and even into, the cells of the plant, and absorb the contents. Being within the plant, they are invisible to the naked eye, and their presence, therefore, cannot be detected. The reproductive stage is the spore-forming stage, and occurs chiefly in the case of the smuts, in the fruiting part of the grain. When the grain-plant forms its head, the threads of the fungus make their way into it, and develop with tremendous rapidity. The entire head and frequently the chaff is filled with the minute threads of the fungus. Just before the plant ripens, these threads break up into a large number of parts, which are the spores or "seeds" of the fungus, and are readily blown away.

The life-story of the smut is, to put it concisely, as follows :

The spores germinate in the spring under the same conditions which bring about germination of the seed. The germ thread sometimes enters the very young seedling plant, but more frequently, perhaps, the germ thread produces a number of secondary spores, which in turn germinate and send their germ tubes into the seedling plant. It will be observed that the germ-spores of smut can affect only their host plants, and only when the exposed parts are very young.

The smut of corn, however, differs from the other smuts in that the infection takes place after the plant is somewhat grown, by inoculation of the immature parts, and not through the young seedlings.

Directions.

Following are directions for conducting experiments in treating seed grain for the prevention of smut.

All of the following methods of treating seed grain for smut have been recommended to the public, and the object of these experiments is to determine which treatment is the best. Experimenters must select No. 1 and one or more of the other three.

It is expected that the directions will be followed closely, and that a report will be sent to W. Lochhead, Ontario Agricultural College, as to the results arrived at.

This report should state definitely :—

(1) The effect of treatment on the sprouting of the seed.

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(2) A comparison of the number of the smutted heads in the pots planted with treated seed and untreated seed.

I. WITH BLUESTONE, BY SPRINKLING THE SEED.

Things needed: 1 lb. bluestone, water, a barrel, and a sprinkling can.

One pound bluestone is thoroughly dissolved in 10 gallons of water, and the seed is sprinkled with the solution until thoroughly moistened The seed should be shovelled over carefully while being sprinkled, and again carefully to dry it.

II. WITH BLUESTONE, BY IMMERSION OF THE SEED.

Things needed: 1 lb. bluestone, water, a barrel, and a coarse sack.

The seed is put into a coarse sack and immersed for 12 hours in the bluestone solution made by dissolving 1 lb. bluestone in 25 gallons of water. The seed is dried by spreading it in a thin layer on a clean floor, and by shovelling it over three or four times until dry.

III. WITH FORMALIN, BY SPRINKLING THE SEED.

Things needed: Half pint formalin, water, a barrel, and a sprinkling can.

The half pint of formalin is poured into five or six gallons of water and stirred. The seed oats are spread out on a clean floor about six inches deep, and the formalin solution sprinkled on this layer until it is thoroughly moistened. As soon as one layer is treated another can be added and treated. The oats should be shovelled over carefully while being sprinkled, and again to dry them.

IV. WITH FORMALIN, BY IMMERSION OF THE SEED.

Things needed: Half pint formalin, water, a barrel, and a coarse sack.

The half pint of formalin is poured into 20 or 25 gallons of water, and the sack, containing 1½ or 2 bushels of seed, is immersed in the solution for about 20 minutes. Then the sack is lifted out of the solution and allowed to drain for a moment or two before the seed is spread out on a clean floor to dry.

Of the twelve experimenters engaged in the work, only one carried out the four experiments to determine the comparative values of:

(1) Bluestone by sprinkling.
(2) Bluestone by immersion.
(3) Formalin by sprinkling.
(4) Formalin by immersion.

Eleven tried (1) and (3). In all cases, untreated oats were also sown, so that an estimate could be readily made as to the value of treating seed.

In every case, but one, the experimenters reported beneficial results from the treatment of the seed.

The season of 1902 was unfavorable to the development of smut, and in most fields where untreated oats were sown, few smutted heads were observed, when the crop began to ripen.

To determine the full extent of the injury, however, it is very necessary to examine the plots carefully every week during the last half of July, and the whole of August; for (1) as a rule, smutted stalks are not so tall as the healthy stalks, and are consequently often overlooked, (2) near harvest, the smutted grains and chaff are blown away, leaving nothing but the slender axis, which may be overlooked.

Eleven experimenters noticed but little difference in the effectiveness of bluestone from that of formalin, and nearly all reported that there were very few smutted heads in either case, and only two or three reported total absence of smut heads. The complete report of the single experimenter is interesting and instructive.

TREATMENT OF OATS FOR SMUT.

Material.	Treatment.	Average number of smutted heads of oats on plots.
1. Nothing		366
2. Bluestone	Sprinkled	65
3. Bluestone	Immersed (12 hrs.)	40
4 Formalin	Sprinkled	..
5. Formalin	Immersed (20 min.)	2

The oat crop of Ontario for each of the last five years is nearly 90,000,000 bushels. Supposing the average price per bushel is 33 cents, then the annual value of the oat crop of Ontario is $30,000,000.

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In some sections, fully one-fourth of the crop is injured by smut; in some more damage is done; while in others less. But if we allow 5 per cent, as injured, then there is a loss of $1,500,000.

Q.: Have you tried dipping the seed in hot water ?

A.: Yes; that has been tried every year here and it is a good remedy. The hot water treatment has proved as effective as formalin, but there is too much trouble about it, and farmers will not take the trouble.

Q.: Where does the trouble come in ?

A.: They must keep the water at 133 to 135 degrees, and for that you require a thermometer. If the temperature is higher, you injure the oats; if, lower, you will not kill the smut. The operation requires about fifteen minutes.

Q.: How long do you allow the oats to remain immersed in formalin ?

A.: Twenty minutes.

Q.: What is the strength of the solution ?

A.: The regular commercial solution is forty per cent.

Q.: Is there any difference in the yield between treated and untreated?

A.: That was not determined this year. I know from previous experiments that the treated always gives better results. There is a possibility, however, of killing out some of your plants by bluestone, or with too strong formalin. One of the neighbors here took full strength formalin, and his oats never came up.

Q.: Is it necessary to sow your seed right after it is treated ?

A.: No ; some keep it over.

Dr. Jas. Fletcher, Central Experimental Farm, Ottawa : There are several important matters in connection with farming that do not get the attention they deserve. The subject now is the smut of oats. Prof. Lochhead has brought before you the best remedies. The hot water treatment is not the best; it is more trouble and expense than formalin or bluestone. I believe formalin is the best remedy. It is less trouble, enables you to treat for one cent per bushel, and it can be obtained at all druggists. I think it is better than bluestone, because the bluestone is slightly injurious to grain, and formalin has very little injurious effect when diluted. It is more penetrating than the bluestone, and, therefore, is more satisfactory. Immersion is very much better than sprinkling, because the oat husk gives an opportunity for the spores to get inside and not be killed in treatment. In regard to the treatment, the effects are not quite similar. With bluestone, the effect is one of killing to a certain extent, but to a much larger extent it is the acting of the bluestone on the fatty nature of the spores by which they are loosened and removed. In the formalin, it is one of killing direct. As to apparatus, the coal-oil barrel is the only thing that is necessary ; it will treat all the seed you need to use. In the immersing, this can be done in a sack, which makes it easier to handle your grain ; but the sack must not be filled too full, or the solution will not penetrate. When the sprinkling method is employed, the best way is to spread the grain out and turn it frequently with a shovel, so as to get all the grain covered. As to the amount that is required to treat a certain quantity, it will depend on the dryness of the grain.

Q.: Has the formalin any effect on the hands ?

A.: None at all.

Q.: In your experience, do your conclusions agree with those of Prof. Lochhead ?

A.: In regard to the formalin being the better remedy ? I agree entirely as to that.

Q.: Is it as effective ?

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A.: Just as effective, much more convenient, and, therefore, more likely to be used.

An Experimenter: We have been troubled a great deal with smut in our oats, and last year I determined to try something to prevent it. We treated 25 bushels of oats with four ounces of formalin in twelve gallons of water. The result was we had no smut. We did not immerse the oats, but merely sprinkled with the water pot. Our experience is, that it does not hurt to keep treated seed. The disagreeableness of handling bluestone is quite enough against it.

Mr. Macoun: Did you try potassium sulphide? I tried it with very satisfactory results in 1897. I thought it was as good a remedy as could be found. Since that time, however, I have not used it.

Prof. Lochhead: I have tried it, but it has not given as good results as formalin.

Mr. Zavitz: We have had some fairly successful results with potassium sulphide in some seasons, but, taking one year with another, it has not given as good satisfaction as either formalin or bluestone.

Q.: How is it that in some seasons there is more fungus than in others?

Dr. Fletcher: That is always the case; it depends very much upon the season. I do not know what the conditions are.

REPORT OF THE COMMITTEE ON FORESTRY.

By R. D. Craig, B.S.A., College of Forestry, Ithaca, N.Y.

It is not for me to dilate on the advantages of the forest to a country, or of the private woodlot to the farmer; that has already been touched upon by the more competent speakers who have preceded me, but last year the Union appointed a Committee, consisting of W. N. Hutt, Chairman; N. M. Ross, and myself, and I shall simply report on the work of this committee.

Owing to its recent establishment and lack of appropriation to carry on any practical investigation, all that the Committee deemed it advisable to do was to send out enquiries to representative men throughout the Province as feelers, in order to determine, if possible, the basis which the Experimental Union will have to work upon in its Forestry Department.

It was thought that as the Experimental Union was an agricultural institution, only those forests which pertain directly to the farm lay within our sphere, and so our enquiries were confined to the farmer's woodlot. The Secretaries of the Farmers' Institutes were chosen as the most likely to furnish reliable information, and, through the kindness of Mr. Hodgetts, a circular containing some eighteen questions was sent to each, and it is upon the answers to these questions that this report shall be based. These questions were as follows:

1. About what proportion of the land in your locality is left under forest?
2. Is there any lumbering being done in your locality?
3. If so, what is being cut (kind and size of trees)?
4. How long ago was the original timber cut?
5. What was the nature of the original forest (pine, spruce, or hardwood)?
6. Of what kind of trees are the woodlots made up now?
7. Did the trees come from seeds, or from the sprouts on stumps after cutting?
8. What is your object in leaving a woodlot?

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9. In what form is your product—cordwood, logs, fence material, etc.?
10. About how much is your woodlot worth to you per year ?
11. Do you allow your live stock to pasture in your woods ?
12. If so, have you noticed any injury caused by the stock ?
13. Are there any young seedlings springing up ; and, if so, what kinds ?
14. Have you noticed any difference in the number and kinds of seedlings in the uncut, cut over, burned over areas ?
15. Have you ever endeavored to improve your woodlot by shutting out stock, or by thinning, planting, or sowing ? If so, what was the result ? If not, do you know of anyone who has ?
16. What is the feeling in regard to forestry in your locality?
17. Have you noticed any beneficial results of the forests upon adjoining crops ?
18. What is the nature of your soil : (1) rocky, gravelly, sandy, clayey ; (2) dry, moist, swampy ; (3) hilly, rolling, or flat ?

The answers indicate that the forests in the more settled parts of Ontario were, fifty years ago, almost virgin, and that even then the hardwoods predominated, but that there was considerable Pine mixed with the hardwoods. The Spruce does not seem to have been at all plentiful in the Southern Counties. At present, the conifers have been almost entirely replaced, which fact is not to be so much deplored when we consider the object of the woodlot, viz., fuel. The different species of hardwoods, arranged in order of abundance, appear to stand about as follows : Maple, Beech, Elm, Basswood, Ash, Oak, Chestnut, Hickory, and Poplar. Of the conifers, which are more abundant in lower sites, Cedar, Pine, Tamarac, and Spruce would be about the order.

In most localities, "lumbering" has entirely ceased, or only a few logs are taken out to supply a local market, and these are mainly of large sizes of soft Elm, some Maple, Beech, Oak, Basswood, Ash, Cedar for posts and ties, and in the newer localities, Pine and Hemlock.

The question, "About what proportion of the land in your locality is left under forest ?" brought out the rapidity and extent of the denudation which has taken place in our agricultural sections. Six men reported less than 5 per cent., and the average of all was 18 per cent.; counting four from Muskoka and Parry Sound, which were over 50 per cent., and leaving out these new districts, the average is about 11 per cent. This corresponds very closely to the reports made to the Bureau of Industries in 1901 by the Township Clerks, which gave an average of 18 per cent. for all counties, including Stormont, Glengarry, Russell, Renfrew, Haliburton, and Hastings, which still have large areas not settled. In the report cited, six counties had over 25 per cent., 10 under 25 per cent. and over 20 per cent., 16 under 20 per cent. and over 10 per cent., and 11 less than 10 per cent., going as low in Victoria as 4.49 per cent. As a general rule, the eastern counties have the most, and the middle counties the least woodland.

Suppose each acre produced three-quarters of a cord per year (which it does not under the present management), and each family uses from 15 to 25 cords, it will be seen that on a farm of 100 acres, supporting but one family, it would require from 20 to 33 acres of woodland. We have not quite that much, but, considering the facility with which coal can be procured in some parts of the country, our acreage is probably sufficient to supply the rural population, if properly managed. But there comes the rub. Our woodlots are not producing more wood, but are rapidly being depleted to such an extent that we may safely agree with the "Weekly Sun" when it says that "In ten years, if there is no change, Ontario farmers will be dependent on coal."

In answer to the question, "What is your object in leaving a woodlot ?" nearly all mentioned the supply of fuel as the main object ; a few thought

of the protection afforded against the wind; and some others had such objects as, "Cost of clearing too great"; "Because I have not been able to clear it," and "Anticipation of the rise in price of wood." Only in this one case was a direct money profit looked for, and others stated that they had no idea of profit whatever.

The estimates of the annual value of the woodlot to the farmer vary from $20 to $300, with an average of about $50. This, as one would expect, is rather low; for, if the farmer depended upon his bush for fuel, and wood is worth 4 per cord, he would take $80 worth out for that purpose alone, besides what he gets as logs, poles, and fence material, and the protection afforded to other crops and stock. One man put the value of the protection to his stock at $100 per year.

Only two of our correspondents said that they did not allow their stock to pasture in the woods, though nearly all admitted that the stock was very injurious, especially to the regeneration; and some also noticed the evil effects of trampling the roots of the larger trees. None, of course, took into account the loss of soil moisture, and the destruction of the seed-bed by compacting the soil. Some contested that if the stock had access to good pasture outside of the bush and merely went into it for shade and protection, little or no harm was done.

Nearly all reported that Maple and Beech seedlings were abundant in the spring, but that where pasturage was allowed, they soon disappeared. Other species do not seem to be reproducing themselves so well, and Pine regeneration is reported only from the northern unsettled districts. Poplars and Willow are only abundant after burns.

The experiment of shutting out stock in order to improve the forest has been tried in only four cases within the knowledge of these men, but the results were good in three of these cases. One man says that on his lot in five years there grew up a thicket of hardwoods five to six feet high.

We had hoped to get track of a few men who had really practised some sylviculture, but in this we failed; and, if anyone can supply us with the names and addresses of such we shall be indebted to them, for their experience would be valuable to others.

In reply to the question, "What is the feeling in regard to Forestry in your locality?" such answers as these are typical:

"There is not much talk about it."
"A growing feeling that we must preserve our woods."
"Not thought of."
"Something in this line must be done."
"Do not seem to appreciate it; would sooner see more land under crop."
"Indifference."
"Have not heard the subject discussed in any way."
"There is plenty of wood for some years."
"Very little attention is paid to the matter so far."
"Thinking men would like to see something done."

From these answers, it would appear that foresters have still considerable propagandic work to do in order to get the average farmer to realize that it is necessary to look beyond the present, and make preparation for a future not far distant, when the supply of this most indispensable article—wood—will be exhausted.

The beneficial effects of the forest on winter wheat was noted by about one-half of the correspondents; others had noticed no effects on adjoining crops; and one man said it was rather a detriment than a benefit. He had, however, a very damp soil, and the increased moisture near the forest, and the shading, was probably the cause for his disparaging observation.

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In general, we may say that the value of the forest is entirely unappreciated by the average farmer, and he does not see the immediate necessity for its protection and improvement. The chief dangers to the farmer's woodlot at present are careless cutting and over-grazing, and it is against these evils that the Experimental Union should head a crusade.

So much for the work of last year. For the future investigation under the Committee, I would like to suggest that a system of experimental woodlots be established, one situated at the O.A.C., and, say 10 others distributed over the Province, where the owners are willing to give their land for the purpose, and refrain from cutting or pasturing without the consent of the Committee.

On these lots, experiments should be conducted on regeneration by natural and artificial means, from seeds, seedlings, cuttings, and coppice; the habits of the different species studied; and the introduction of new species, such as Tulip, Poplar, Chestnut, hardy Catalpa, Walnut, Norway Spruce, Scots Pine, Douglas Fir, etc., tried. Experiments in thinning and pruning should be made, keeping track of the time and outlay required for the operation. These lots should be inspected annually by a member of the Committee, who should report on the growth and other changes in the stand, and should instruct the owner on future management.

A nursery should be established from which seedlings can be supplied to the farmers, and where experiments in nursery practice can be conducted, and the best place for this should be at the Ontario Agricultural College, where it would be instructive to so many farmers visiting that institution, as well as to the students in attendance.

By these means, instructive exhibition stands would be within the reach of farmers, and data will be collected which will be not only extremely practical, but will be of use to scientific foresters who are to follow. It seems to me that in no other way can this Experimental Union make a more lasting monument to itself, and at the same time confer a great and much-needed benefit on the Ontario farmer.

The Union probably cannot supply the money necessary to do justice to this work; but I do not think it should be hard to persuade our liberal Government to give a grant of, say, $1,000 for this object; and, in conclusion, I would ask that the members of the Union give their support to the Committee of Forestry in the work they propose to undertake.

The discussion on this, Mr. Craig's, report, is included in that on Dr. Fernow's address on the "Farmers' Woodlot," to be found further on in this report.

REPORT OF CO-OPERATIVE EXPERIMENTS IN POULTRY WORK.

By W. R. Graham, B.S.A., Manager Poultry Department, Agricultural College, Guelph.

Our experiments this year have been with artificial incubation. Incubators succeed with one man, but fail with another, and there seems to be a great diversity of opinion as to temperature, etc. With a view of solving some of these problems we conducted a series of tests through our experimenters. In order to secure accurate results, we used an incubator chart designed by Mr. Baldwin of Toronto. The work is, of course, rather detailed. The majority of the men who undertook the experiments failed to give us any results. Some wrote that their experiments had not been

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very successful, and, therefore, they did not desire to hand in a report. Those were the very ones we wanted to hear from. This work has only just commenced, and the results so far are not of any particular value in themselves. Another year we shall be able to give you some information as to where incubators should be placed, what percentage of moisture in the air is required, whether hot water is better than hot air, etc.

I was rather surprised at some of the results this year. The largest hatch recorded was from a machine run in an ordinary bedroom. The next best was from an incubator run in a dining room. You would think that in a dining room the incubator would receive more or less jar, and it has always been contended that this must not take place. There were five experimenters, and 3,226 eggs were set, of which 2,300 were fertile upon the first test. At the second test—on the 14th day—1,755 eggs were fertile, or 76 per cent. of the number of fertile eggs of the first test. These gave 998 chicks, or about 30 per cent. of the eggs set. I think that in time when we get more data there will be still more surprising results as to the number of eggs it takes to produce a chicken. In January and February, in some cases, it took as many as seven eggs to produce a chicken.

L. H. Baldwin, Deer Park, Toronto: The results Mr. Graham has given have come from very few experimenters, and where the number is small, and there has been a great loss with one experimenter, the general average is very much reduced. In my experience the running of the incubator is the easiest part of the work. The difficulty really lies in the first instance in getting eggs with a strong germ; and then the difficulty in rearing the chickens. The artificial brooder is not at all essential. It is not difficult to place your chicks under broody hens. On the farm you cannot get your hens to brood early, or only a few. That throws you late in hatching your chickens, and, being late, they make poor winter layers, and are late again the following year. But you can set an incubator at will. When they hatch it is a simple matter to place these chickens under broody hens, giving a great number to each hen. If you have 110 chickens hatched, it would not be unusual to put 15 under each hen; so that you do not require the same number of hens to cover that number of chickens as you would if they were hatched by natural means; so that a farmer may introduce the incubator without the brooder, which is a considerable expense.

Chickens should be removed from the incubator at night time and placed under broody hens which have been sitting on china eggs for a few days.

With regard to the incubator charts, I have kept very close details of the results for a long time, and it is wonderful what one can learn from year to year in this way. The more experimenters there are keeping these records the quicker shall we arrive at conclusions that will be valuable. It may take me ten years to accomplish what ten men would accomplish in one year. Sometimes a pure accident will start an entirely new experiment. Such an accident occurred with me this year. In running an incubator there are four or five points to be borne in mind: First, temperature; second, humidity; third, the amount of ventilation; and fourth, the amount of cooling you are to give the eggs. The accident I speak of was connected with the cooling process. I accidentally left my incubator door open for three hours, and the temperature went away down. This was on the 14th day, and I was very curious to know what the result would be. Now, some chickens usually hatch about the 20th day, and most of them on the morning of the 21st day. Those that hatch on the 20th day are a little ahead of time, and are not as strong as the others. I found that on the 20th day not a single chicken hatched, but all hatched at the same time on the 21st day. (I had as good an average in

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number and a more uniform lot of chickens.) That made me realize that we were not cooling our eggs enough, especially during the latter part of the hatching. A friend of mine told me he had identically the same experience. You should, therefore, try a little more cooling of the eggs after the 10th day. We know that oxygen is essential to life, and, therefore, the ventilation of the incubator is very important. I like to take the eggs right out of the incubator and lay them on the table. It gives them a great chance to get oxygen from the air, and gives them life and vigor. I heard of one experimenter who pumped oxygen into the incubator, and claimed that by that means he not only hatched the strong germs, but strengthened the weak germs, and that he could hatch every fertile egg. I am convinced that you will find that the incubator is not only a simple machine to run if given attention, but that it is a very practical help to the farming community, and will enable you to produce early chickens.

Dr. Mills: Is it possible to handle birds in confinement, such as we have here, and get a good proportion of fertile eggs?

A.: I believe it is. Fresh air is the secret of it; the windows should not be kept shut, or the health of the birds will suffer. Open your windows, even if the temperature is below zero. Do not leave them open long.

Q.: What about lack of exercise?

A.: I always keep straw on the floors, and bury the feed in it. The hen then has to turn over the straw, and obtains exercise in that way.

Q.: How often do you change the straw?

A.: Only once a year. In August my hen houses are completely cleaned out. I have no board floors, only sand. This is also cleaned out, so far as the droppings are mixed with it. Then fresh sand or dry earth should be put in, and straw on top of that. I keep adding to the straw once a month through the winter.

Q.: How deep does it get before spring?

A.: It gets mixed by spring; but there will be about six or seven inches of loose straw.

Mr. McNeill: One load of dry earth will disinfect the droppings of fifty fowls for a year.

Mr. Baldwin: I should say that the straw mixed with the droppings would make a very valuable fertilizer.

Q.: Is the scratching shed kept separate from the roost?

A.: Yes; but you can have a combination. The scratching shed is, perhaps, trying in very cold weather.

Q.: Do you recommend the same temperature right through the hatching?

A.: It is well to keep the temperature of the eggs themselves as near 102 1-2 degrees as possible from start to finish.

Q.: To what temperature would you cool the eggs?

A.: To about 85 degrees.

THE HOG AS A MONEY MAKER.

By T. H. Mason, Straffordville.

In his opening remarks on this topic, Mr. Mason pointed out the great growth that had taken place in the export trade of bacon during the past ten or twelve years. Previous to that time we imported more than we exported, and our bacon was of such an inferior quality that it was not popular. Methods, however, had changed, and we were now producing a very satis-

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factory article. Our exports to Great Britain had now reached the thirteen million mark, and he looked for a still greater development of our bacon trade, and thought that the prospects for the coming year were exceedingly favorable. He then went on to say: The fact that seventy-five per cent. of our bacon is exported, and only twenty-five per cent. of it used in Canada, shows how important it is that we should produce the sort of hogs necessary to meet the demand of the export trade. The sort of hog the packer requires is one weighing at maturity 160 to 220 pounds, preferably between 180 and 200 pounds, because it is between the latter weights that the largest percentage of first-class bacon carcasses are found.

The weights asked for by the packers to-day are the most profitable weights for us to produce. From my own experience, after looking into the matter for several years, I am convinced of this. I maintain that under average conditions, and with the average breeds of hogs of all kinds, after we pass the 200-pound mark, we have passed the profitable point, and the sooner we get rid of those hogs the better for us. If, however, we should have extraordinary conditions, such as low prices for grain and high prices for hogs, it would be profitable to continue feeding a little longer. On the other hand, with high prices for grain and low prices for hogs, the sooner we place them in the packer's hands, the more profitable it will be for us.

The question is often asked: "Is the lengthy hog, such as the packer demands, the most profitable hog for the farmer to produce?" I say that it is. I do not say that we should go to extremes and produce an abnormal hog, but what I do say is that we should produce a moderately lengthy hog, with good bone and good constitution. Ask any practical hog producer who goes out to buy store hogs what he wants, and he will tell you a moderately lengthy hog with good bone and good constitution—one that looks like a feeder. The majority of farmers who have made a business of feeding prefer the moderately lengthy animal.

As to the question of breeds, I do not know that we can lay down a hard and fast rule, and say that there is one particular breed possessing all the good qualities. There are several breeds that are giving good results, such as the Yorkshires, the Tamworths, and the Berkshires. For my own part, I like a first cross between two pure breeds. I think I get a more vigorous feeder and better constitution, and obtain better results generally from this cross than from pure breeds; but the second cross is not as good as the first. I would not go farther than the first cross.

As to the handling of hogs, I believe that for summer conditions we get the best results by feeding on pasture with clover, grass, peas, oats, tares, or rape. The advantage of this system is that the exercise obtained when pasturing promotes strength in the digestive organs, and tends to produce a more lengthy hog, a better development of the muscular system, and a larger percentage of lean meat. A hog treated in this way is in a stronger and more healthy condition, and will give better results for the grain fed afterwards in the finishing process than the hog fed in the confinement of the pen.

We must remember that to-day Ontario is largely a dairying country, and the production of hogs from the by-products of the dairy, along with other foods, makes it possible for us to produce pork very cheaply, and at the same time of excellent quality. I would lay special emphasis on:

(1) Giving proper attention to the selection of parents;

(2) Breeding entirely from mature animals;

(3) Giving small pigs a good, strong start on the sow, and not weening them before eight or nine weeks old;

(4) Using dry beds, frequently changed—dampness being fatal to young pigs; and

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(5) Furnishing in winter, fresh earth, sods, wood ashes, and charcoal, and, whenever the weather is mild enough, letting the pigs out for exercise and to get access to fresh earth.

THE PRODUCTION OF FIRM BACON.

By J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa.

The feeding of pigs for the production of first-class bacon is an art which it is hopeless to attempt to discuss profitably in ten minutes. There are, however, certain feeds, certain requirements, and certain conditions which influence more or less strongly the quality of the product, so far as firmness is concerned, and to these I would direct your attention.

To begin, let me urge that those who confound "Soft Pork" with "Fat Pork" disabuse their minds of this mistake, and remember always that the "Fat Hog" is the "Firm Hog" quite as frequently as is the hog that bears a thinner layer of fatty tissue.

Yet, again, do not infer that certain breeds always produce "soft pork." So far as breed influence on firmness is concerned, I think I am right in saying that any one of the common breeds is as good as any other of the same. Some breeds, such as Duroc Jersey, and Poland China, doubtless tend to produce short, thick sides. These may, however, be quite as firm as the most perfect Wiltshire side ever grown.

The influence of locality or climate is one that has come in for more or less consideration, but, so far as we can ascertain by experiment, is a factor of very small importance; in fact, quite negligible, save in so far as it influences the kind of food fed the pig. Certain sections are noted for a good quality of bacon, but doubtless because of certain feeds peculiar to that district. While other sections produce large quantities of soft pork, no doubt because of certain feeds commonly fed there.

The most common causes of soft pork, so far as we can find out by experiment, observation and inquiry, are:

1. Feeding pigs too rapidly from birth to the required weight. This rushing process, while it does not always give bad results, frequently produces soft sides, and not seldom are the carcasses both "soft" and "thick."

2. "Feeding off," or, rather, selling when under weight or before maturity, our experiments have shown very clearly, is the one almost certain indication of softness. Generally speaking, also, the degree of immaturity may be taken as the measure of the softness; that is, the further from maturity, and the softer the flesh is likely to be.

3. Improper feeding. Pigs fed on any ration not conducive to health, or fed in any way not favorable to thriftiness, are almost certain to yield a large percentage of "softs," while properly fed hogs will yield a high percentage of "hards." In brief, I think I am perfectly safe in saying that 99 per cent. of properly fed and properly cared for pigs will produce firm meat.

Properly cared for pigs, means pigs fed under conditions conducive to health and thrift. Airy, roomy, light quarters are the right sort. If space is an expensive consideration, as it usually is, especially in winter, then let the small space be well ventilated, well lighted and kept clean. Large runs are not necessary where the other conditions are provided.

Feeds. The most important factor in the production of firm bacon is, undoubtedly, the food.

The preparation is, apparently a matter of minor consideration, so far as influence upon firmness of flesh is concerned, save in so far as it affects the health of the animal.

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The rate of feeding is of more or less importance, as indicated above, since "rushed" pigs produce more or less "softs."

The kind of feed is the thing. Corn fed alone produces a very large percentage of "softs." Corn fed with a small proportion of skim milk or whey gives much better results. After the skim milk or whey constitutes 10 or 15 per cent. of the dry matter of the ration, the proportion does not appear to greatly matter. Just incidentally, the addition of such an amount of skim milk, or whey, cheapens production materially. Roots, clover, steamed or green, rape, or grass may take the place of skim milk with corn and give results nearly as good. A small proportion of corn with the cereals, oats or barley, or with peas, does not appear to have a very injurious effect.

Barley is unsurpassed as a feed for the production of firm bacon. Oats, also, are most excellent. Peas produce good results, and, mixed with other grains, are exceedingly valuable.

In conclusion, skim milk or whey are almost infallible guarantees of firm pork. The cereals and peas properly fed constitute an almost faultless ration. Corn may be fed, but must have some counteracting food along with it, or it will give bad results.

POTATO BLIGHT AND ROT.

By W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

During the past season potato blight and rot caused serious loss to the farmers in Canada, and although a good preventative is known in the Bordeaux mixture, few growers sprayed their potato vines this year. The average crop of potatoes per acre for the Province of Ontario, as given in the November Crop Report, was 89 bushels. There are other causes, however, besides the early and late blight, which lessen the yield of potatoes, among the most important of these being, the variety used, the kind of seed planted, lack of proper cultivation, the character of the soil, injury to foliage by the Colorado beetle and flea beetle, and tip burn or scald. The crops of potatoes which it is possible to obtain if the conditions are all favorable are so large that they are well worth striving for. The late E. S. Carman, formerly editor of the Rural New Yorker, raised potatoes, from a very small area it is true, at the rate of 1,800 bushels per acre, and in a competition which he had among growers, potatoes were raised on a one-twentieth acre plot at the rate of 1,061 bushels per acre.

At this time the reasons for small yields cannot be gone into in detail, but as showing the importance of planting the most productive varieties it may be said that in a test of 130 kinds at the Central Experimental Farm in 1902 the highest yield, which was from Peachblow, was at the rate of 690 bushels 48 lbs. marketable potatoes per acre, while the lowest, which was from the Houlton Rose, was only 123 bushels 12 lbs. per acre, a difference of 567 bushels 36 lbs. per acre.

There are two known blights which affect the potato in America, the early blight, *Alternaria* [illegible] and the late blight, which causes the rot, *Phytophthera infestans*. The early blight causes the spotting of the leaves early in July. These spots increase in size, unite and form large masses of diseased tissue. This blight does not attack the tubers, and is not nearly as injurious as the other. If the leaves are punctured by flea beetles, or from some other cause, the disease gets a foothold easier. The late blight is the one which causes by far the greatest loss, both by lessening the crop and by

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causing rot. This disease passes the winter in the tubers and in the spring when the vines begin to grow it starts to develop, growing up through the tissues of the potato stem. During the latter part of July it produces on the undersides of the leaves myriads of tiny spores, which in the mass have a frost-like appearance. These spores make the rust stage, which is caused by the leaf tissues drying up where the spores have been feeding on them and causing dark brown spots. It is from this stage that future infection takes place, as the spores are carried rapidly by the wind and alight on the foliage. They are also washed below the surface of the ground and reach the young tubers, and in time cause the rot. The potato rot itself is a dry rot, the wet rot comes through decay of the tubers. In a bulletin published by Dr. James Fletcher, who has for many years made a special study of potato blights, in 1894, these blights are fully described and treatment recommended. It is when the tubers begin to form that the blight begins to appear. This is just after the potato has passed the most vigorous stage, the stage when in a wild state it would be blossoming and producing seed. At this stage the constitution of the plant is weakened, which probably makes it more subject to disease at this time. Usually in the Province of Ontario potato vines dry up during the latter part of August. Why should potato vines die so soon when they do not produce seed? My experience is that even the earliest varieties can be kept growing well into September by thorough cultivation and spraying if the season is fairly favorable. The important point is to get them past the period when they are in a weakened condition, without injury from fungous diseases or insects.

In 1893 experiments were conducted at the Vermont Experiment Station by Prof. Jones, who has done very valuable work in the investigation of potato diseases and their remedies, to determine how rapidly the tubers developed in order to show how important it was to keep the vines growing as late as possible. The results which are here given are very striking:

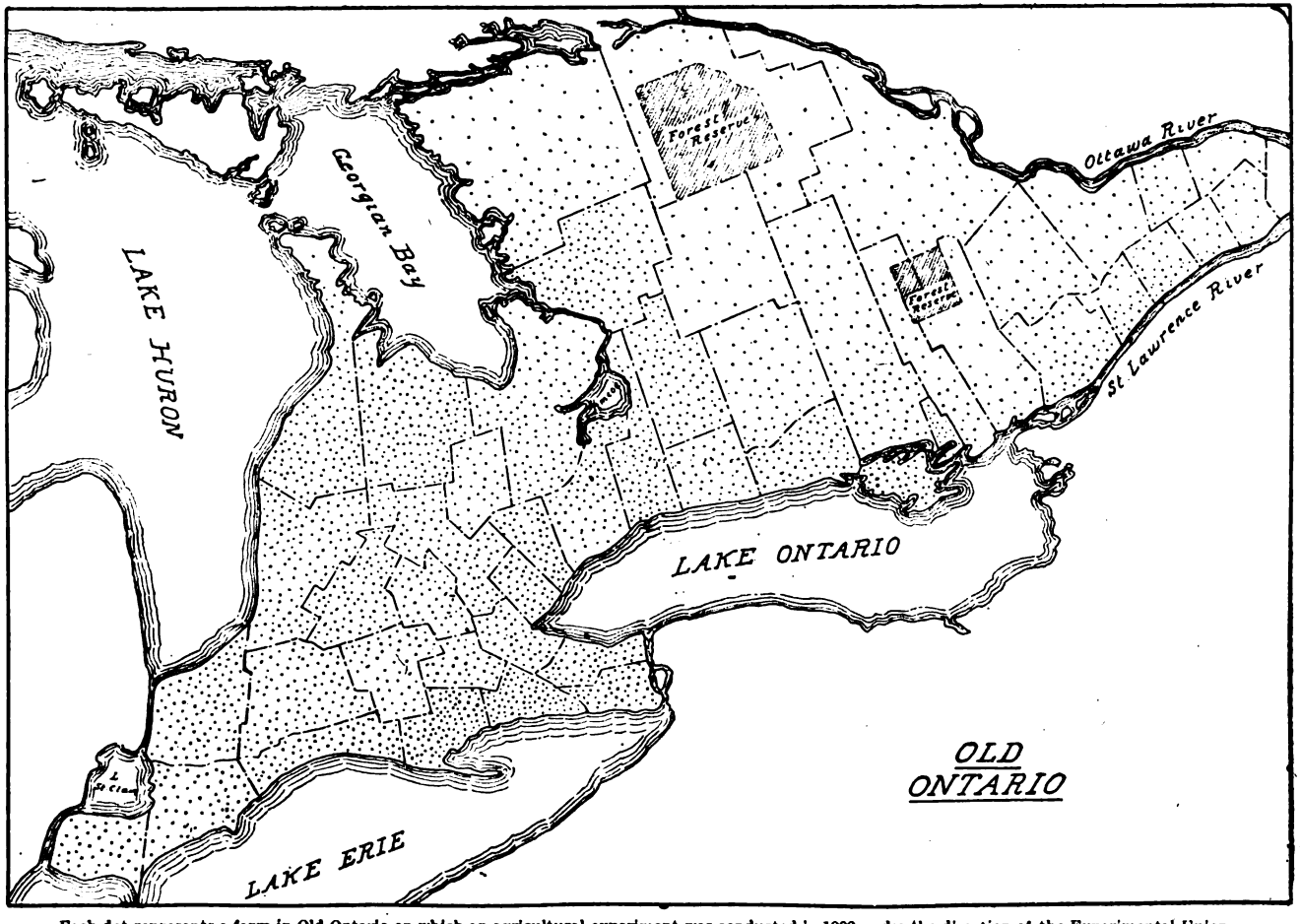
YIELD OF TUBERS DUG AT DIFFERENT DATES.

——	Total Yield Per Acre. Bushels.	Yield of Marketable Bushels.
August 2nd	58	Not sorted
" 12th	115	Not sorted
" 22nd	230	163
September 1st	304	234
" 12th	356	303
" 22nd	379	353

This experiment proved that over half the crop of marketable potatoes was produced after August 22nd. In Ontario potato vines are usually dead shortly after that date. The great gain in keeping potatoes growing until late in September is here very apparent. In 1901 and 1902 I obtained very marked results at the Central Experimental Farm by spraying with Bordeaux mixture for the prevention of blight, but before giving these results it may be well to mention some obtained elsewhere. In an experiment conducted by the Department of Agriculture in Ireland in 1900 it was found that sprayed potatoes yielded 9.36 tons per acre, and unsprayed 3.78 tons, or a gain of over 200 bushel per acre where sprayed, making a cash difference of £25 12s 9d. per acre.

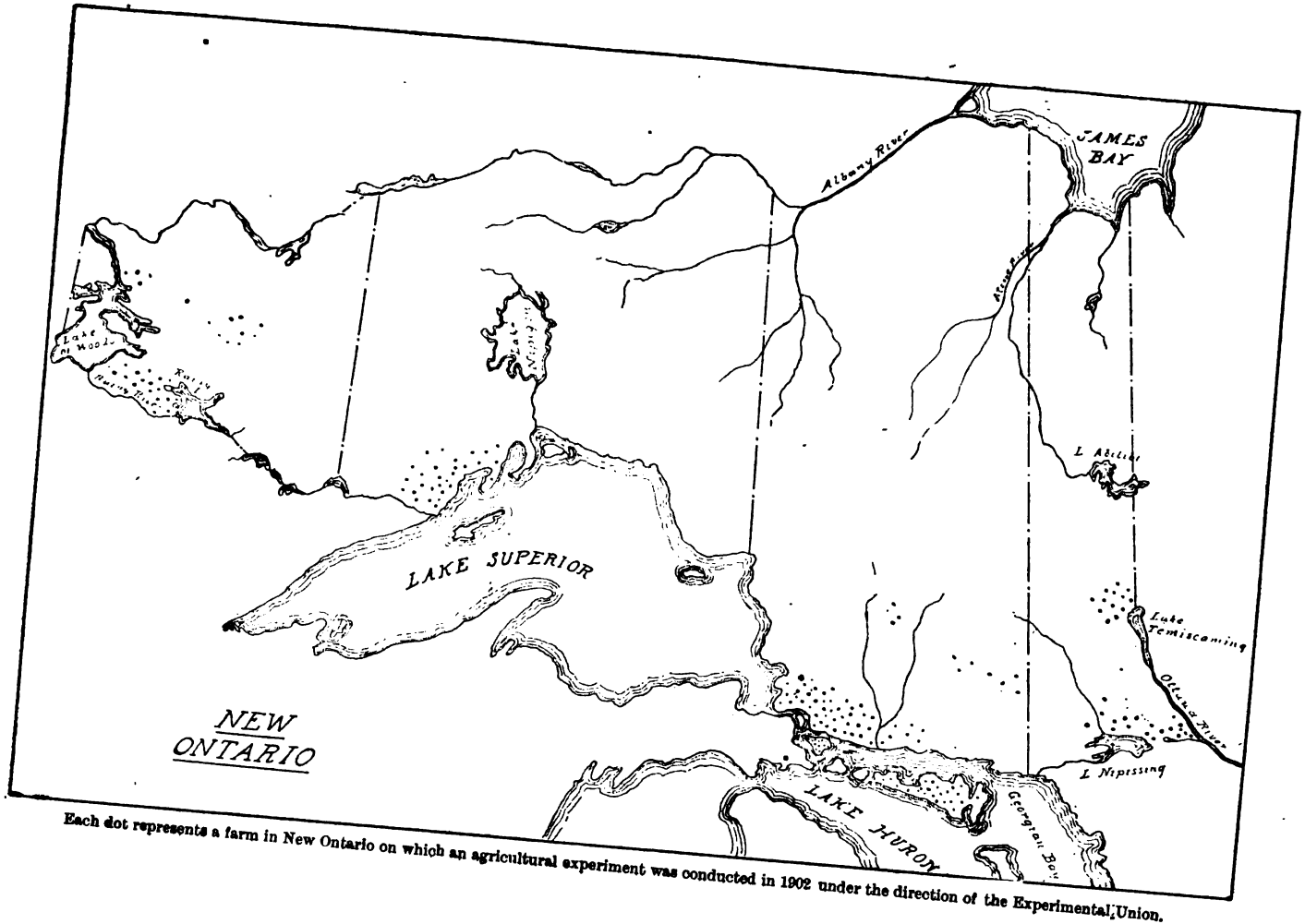
At the Vermont Experiment Station, taking the average results for eight years, 1891 to 1898, the sprayed potatoes averaged 296 bushels per acre,

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Each dot represents a farm in Old Ontario on which an agricultural experiment was conducted in 1902 under the direction of the Experimental Union.

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and the unsprayed 173 bushels, a difference in favor of spraying of 123 bushels per acre.

In 1901, eight varieties were sprayed at the Central Experimental Farm and the same kinds left unsprayed. The average difference in favor of spraying was 100 bushels of marketable potatoes, though with the Burnaby Mammoth there was a difference in favor of spraying of 177 bushels per acre, and with the American Wonder 144 bushels per acre. In 1902, 11 varieties were under test, when the average yield per acre of marketable potatoes of all the varieties sprayed was 310 bushels and where unsprayed 190 bushels, or a difference in favor of spraying of 120 bushels per acre. With the Empire State variety there was a difference of 165 bushels per acre, and with the Early Ohio a difference of 201 bushels per acre. The average date when the vines died of the varieties which had been sprayed was September 25th, while that of those unsprayed was September 7th. The vines were sprayed four times, on July 10th, July 22nd, July 30th, and August 13th, the formula being used being: 6 lbs. bluestone; 4 lbs. lime; 40 gallons water.

While the Colorado potato beetles were still active, 8 ounces of Paris green were added per barrel of 40 gallons of this mixture. The expenses per acre were:

114 lbs. bluestone per acre at 7c lb.....	$7.98
Labor per acre, 4 sprayings.....	2.80
	$10.78

For large areas the expense for bluestone would be in the neighborhood of $6.00 per acre, and the total expense probably not more than $8.00 or $9.00, as less material would be used and the work done with greater saving of time. Even at $10.78, which is near the actual cost in the experiment this year, the profits would be:

120 bushels, increase where sprayed, at 40c bushel....	$48.00
Expenses.....	10.78
Net profit.....	$37.22

If the variety Empire State alone had been planted the gain would be $55.22, and if Early Ohio, $69.62.

These results should sufficiently convince potato growers of the importance of spraying their potatoes for the prevention of blight and rot. The work must be thoroughly done. Spraying should be begun by the middle of July or before and the vines kept covered with the mixture until the close of the season.

The President: I understand that Mr. Jones has had great success this year in a district where blight had been bad.

Mr. Jones: I conducted an experiment with one and a half acres this year, and kept track of the results for my own benefit. Mr. Macoun said that the total expense of spraying an acre at Ottawa, including work, was about $12. Now, his potatoes were planted very closely, about thirty inches apart, or less, with the rows about twelve inches apart. I planted in hills with a large growing variety, called Uncle Sam, about thirty inches apart both ways. In spraying, I did not use a rose sprayer; I wanted to be a little economical with the material, and I got two lines of hose, each twenty feet long, which gave me a spread of twenty feet on each side of my wagon. I employed one man with each hose and one with the wagon. I gave six applications, the first on June 16th, and one every two weeks following, until the 1st of September. The actual cost was $3.74 per acre for bluestone. I am not counting Paris Green, as we have to apply that anyway for the bugs. It took for an acre the equivalent of one man's time for thirty hours, counting the horse as a man. The

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nozzle used was a Vermorel, and every plant was thoroughly sprayed. The results were absolutely perfect and satisfactory. There were less than twelve bushels of seed planted and the crop was considerably over 300 bushels to the acre, all perfect potatoes, small ones. They grew from May 11th till the last week in October, when the vines were still growing. The last few weeks of the season is the time when the crop doubles itself, and that is the period when we must strive to keep the vines in a growing condition.

Q.: How much did it cost per acre, taking everything into consideration.

A.: Four dollars for labor, and $3.75 for the sulphate of copper.

Mr. Macoun: I would like to explain the difference. My estimate was made in the highest figures that I though it fair to give, because I should not like any one to try this and have it cost more than I said. You can always do a large area at less expense than a small plot.

Q.: At what stage of the vine's growth would you give the first spraying?

A.: I would take no chances. The bluestone costs very little, and I would apply it when you do the Paris Green.

Q.: Must it be applied below the leaves ?

A.: The results will be better if you do so.

IMPURITIES IN FARM SEEDS.

By G. H. Clark, Chief of Seed Division, Department of Agriculture, Ottawa.

When I was asked to give a short talk on the "Impurities in Farm Seeds," I wondered what I could say in the course of ten minutes that would be of interest to the members of this Association. I have no doubt that I am expected to say something about weed seeds.

I shall not discuss the impurities of root crop seeds ; their quality is affected to a greater extent by the kind of roots from which the seed was taken. I believe that Canadian farmers would get better results from these crops if the seeds used were home grown, and from selected and transplanted roots.

It is always important to use seed of common grain crops that is free from noxious impurities. It is with seed of cereal crops, and chiefly with seed oats, that Wild Oats, Bindweed, Wild Mustard, and other weeds are allowed to spread. Weed seeds that are commonly found in cereal grains are not nearly so widely and rapidly disseminated as those found in grass and clover seed.

There is a great deal of room for improvement in the field crops in Canada by the use of better seed. I consider that in the case of cereal grain, pedigree is almost, if not quite, as important as impurities. We seldom hear anything of pedigreed seed here in Canada. It is a term with which English and Scottish farmers are better acquainted. So far as I know we have no recognized way to differentiate between grain that is grown specially for seed, and grain that is grown for food purposes.

Much improvement would doubtless be made in field crops if a few farmers in each locality would make a specialty of growing pure and improved seed in quantity.

There are still plenty of farms in the Province of Ontario that are reasonably free from weed pests, and are well suited to the growing of cereal grain crops. It is from such farms that supplies of seed should be taken.

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Though I am not prepared to make a definite statement, I may say that arrangements have already been considered by which pure seed of our common grain crops that have been improved by careful growing and continued selection may be known from grain that is grown for food purposes. There is now in Canada several hundred lots of seeds that are entitled to some such recognition. I refer to seed improved in connection with the Macdonald Seed Grain Competition. Organizations which provide for the registration of improved seed, are doing good work in other countries, and I have some hopes that arrangements will be completed in a way that will encourage seed growing as a special industry in Canada.

During the last three years I have had occasion to travel a great deal through the agricultural districts of the Maritime Provinces, Quebec, and Ontario. I have found that travelling over country roads day after day with a bicycle, or even with a horse, is not always an ideal occupation for a gentleman of leisure, but I am very glad to have had an opportunity to get acquainted with some of the difficulties with which farmers in the various districts of those Provinces have to contend. The work we have been doing this year in the Seed Laboratory at Ottawa was planned with a view to overcome some of these difficulties.

The losses that are sustained because of the prevalence of weed pests is a very serious problem in every district where I have been. Of course, weeds become disseminated in other ways than with seeds, but unwittingly sowing weed seeds with grass and clover seed is an exceedingly fruitful medium for the wholesale spread of weed seeds from field to field and from province to province.

Early in the current year I was authorized by Prof. Robertson, who is my superior officer in the Dominion Department of Agriculture, to secure the necessary equipment for a more modern seed laboratory, and investigate the conditions of the trade in grass and clover seeds. With a view to getting some accurate information regarding the extent to which weed seeds are sold, we collected and examined several hundred samples of Timothy, Alsike, and Red Clover seed that were on sale by local dealers in the towns and villages in the different provinces of Canada. With each sample of seed information was received giving the name of the place at which and the dealer by whom it was sold, the price per pound or per bushel and the name of the wholesale house from which it had been obtained.

Over 45 species of weed seeds were found in the samples that were analyzed. The following table gives the common and scientific names of some weeds, the seeds of which were found in the samples examined. It also shows the per cent. of the samples of each of Timothy, Alsike, and Red Clover in which seeds of the weeds named occurred :

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Name of Weed.		Per cent. of samples in which seeds of weeds named were found.		
Common.	Scientific.	Timothy.	Alsike.	Red Clover.
Black Medick	*Medicago lupulina*, L		23.2	4.9
Curled Dock	*Rumex crispus*, L	11.3	33.3	54.3
Canada Thistle	*Cnicus arvensis*, Hoffm	18.5	34.4	23.8
Charlork or Wild Mustard	*Brassica Sinapistrum*, Boiss		1.1	7.
Chicory	*Cichorium Intybus*, L	3.3	2.2	.6
Cinquefoil	*Potentilla Norvegica*, L	60.3	17.8	1.8
Catnip	*Nepeta Cataria*, L	7.3	28.9	19.5
Ergot	*Claviceps purpurea*, Tul	4.6		
False Flax	*Camelina sativa*, Crantz	13.2	63.2	3.7
Green Foxtail	*Setaria viridis*, Beauv	9.3	40.	94.5
Lady's Thumb	*Polygonum Persicaria*, L	1.3		62.2
Lamb's quarter	*Chenapodium album*, L	42.	72.2	73.8
May-weed	*Anthemis Cotula*, DC	23.8	43.3	31.1
Ox-eye Daisy	*Chrysanthemum Leucanthemum*, L	6.	5.6	.6
Perennial Sow Thistle	*Sonchus arvensis*, L	.7		
Pigweed	*Amarantus retroflexus*, L	7.9	14.4	36.
Plantain	*Plantago Major*, L	34.4	22.2	22.7
Peppergrass	*Lepidium virginicum*, L	38.4	34.4	1.2
Ragweed	*Ambrosia artemisiæfolia*, L			1.2
Ribgrass	*Plantago lanceolata*, L	4.	20.	62.2
Shepherd's purse	*Capsella Bursa-pastoris*, Mœnch	6.6	14.4	
Sheep Sorrel	*Rumex Acetosella*, L	40.	90.	52.4
*White Cockle	*Lychnis vespertina*, Sibth	13.9	76.7	59.1
Worm-seed Mustard	*Erysimum cheiranthoides*, L	7.	14.4	1.2
Yellow Foxtail	*Setaria glauca*, Beauv	6.		11.

*White Cockle as a common name is also frequently applied to *Silene noctiflora*. The two plants ar quite similar and the seeds from them are almost identical.

Q.: What was the percentage of noxious weeds per pound ?

G. H. Clark : I may say that the impurities found were not restricted to weed seeds. In a few samples we found from ten to thirty per cent. by weight of sand. Less than two per cent. of the samples analyzed were free from weed seeds. Sixty-three per cent. of them contained over 2,000, forty-four per cent. over 5,000, and 25 per cent. over 10,000 weed seeds per pound. The only sure way to clean weed seeds from clover is to pull and remove the weeds before the clover is cut. If farmers would pay a little more attention to the impurities in the grass and clover seed they raise, they could do much to improve the quality of the seed on the market. If they would also be willing to pay a fair price for their seed, and demand the best quality from the seed merchant, asking him to give a certificate showing that the seed is free from noxious impurities, they would doubtless get better seed. Trade usually bends to reasonable demands, and I do not think it is at all unreasonable to ask for guaranteed seeds.

A Member : It strikes me that unless our Government takes some steps in this matter, we are going to have a worse pest than the San Jose Scale. These foul seeds have spread over the country lately at a very rapid rate. You may be willing to pay any price for pure seed, but cannot get it.

The President : I think I observed somewhere that at the next session of Parliament there will be a measure presented to establish a standard of purity for seeds.

ADDRESS.

By Hon. John Dryden, Minister of Agriculture, Toronto.

I have always been interested in the work of the Experimental Union. I have not hesitated to call it, in the Legislature and out of it, college ex-

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tension. We have undertaken by this organization to carry part of the work conducted at this institution into the different counties of the Province. The work had a very small beginning, and those who first organized it doubtless never dreamed of its ultimate usefulness. But it has grown, until I have no hesitation in saying that it has become one of the most influential and important organizations in the Province connected with our agricultural interests. It is easy to see that each of your experimenters, when he commences to conduct work similar to that carried on here, becomes a centre of influence in his locality. For instance, when Mr. Zavitz, through this Union, sends out a variety of corn, and one of these experimenters receives it and grows it successfully, it is seen by those living in the vicinity, and is recognized as an improvement. The work is then copied by others, and thus the influence spreads and continues to spread.

Who can tell how much increased wealth has come to the Province because of the introduction of two varieties of fall wheat first planted here and scattered over the Province largely through these experimenters? I refer to Genesee Giant and Dawson's Golden Chaff. The millers tell us these are not the varieties they would like us to grow, but they have enabled us to increase the quantity materially, and as our wheat has yielded better returns when fed to our animals than to human beings, we need not trouble so much about the particular quality. That is what is being done with a considerable portion of it just now. It is a great thing to increase the value of products by adding a bushel per acre to the quantity of the oats or corn grown in this country. But this is not the only instance; I merely mention it as an illustration. The Union deals with a variety of things, in fact, covers everything on the farm, from the original forest down to the home, and these are the two topics which are to be presented here to-night. The forest was here before the home, and so we will have Dr. Fernow present his lecture first. My father was in this country when, I will guarantee, there was not a tree cut on the spot where we are now assembled. He went to the farm where I now live before a tree was struck with an axe. How quickly the forest has passed away, and in its place, even in one lifetime, the country has been dotted over with pleasant homes. Now, I will not say there can be no improvement in those homes; I think that a big improvement can be made. I should like to say that there is no one I have a greater sympathy for than for the women in our farm homes. They have not the conveniences of town and city. They labor and toil the year round, and it ought to be the study of somebody to make their lives as pleasant as possible. From these farm homes come our greatest, and, I was going to say, our best men. If you trace the history of the greatest men in this country and the United States, the chances are that they were born and brought up in a farm home. It is worth while, therefore, to try and improve these homes as far as we can, and there is no doubt that a great deal is being done in these days. I hope that the address we shall hear to-night will help us to appreciate the home and do what we can to develop it.

THE FARMERS' WOOD-LOT.

By Dr. B. E. Fernow, Director of the College of Forestry, Ithaca, N.Y.

I consider the report just read by Mr. Craig a very valuable piece of work. It starts out by ascertaining what the present conditions really are before making any propositions as to how those conditions may be improved. All will agree that it has been written by a practical man, and I am proud to be

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a director of the college from which such men issue. Mr. Craig is one of the first Canadians to come over the line for the purpose of procuring a professional knowledge of forestry.

I suspect that the subject of the farmers' wood-lot was asigned to me because it was supposed I had given considerable attention to it in connection with the forestry question in general. I am very much afraid I may disappoint my listeners by the way in which I have been looking into the subject hitherto. I see that the farmers of Ontario have looked at the matter in the right light, but a great many people in the United States have supposed that the wood-lot would have a very great influence upon the question of forest supplies in general, which is not the case; and it is this, no doubt, that has led me in thinking the matter over to put it in rather a secondary place. In other words I have been forced by my position in Washington to look at the forestry question as one involving a continuance of forest supplies for our wood-consuming industries. Not less than four thousand million feet of lumber and similar material is used annually in these industries. It is difficult to conceive such a quantity. It may give you some realization of what it means to say that it is ten times as much as the entire export of wood and wood products from Canada. Over three hundred million dollars' worth of raw lumber is required to furnish the wood-consuming industries of the United States, not to mention firewood, railway ties, etc. The question is: where, when the virgin timber has been cut, will this supply come from? Many people in the United States have pointed to the farmers' wood-lot as one of the many sources from which we may expect supplies. It is true that every little helps, and that if all the woodlots on the farms of the United States were combined, it would make a large area from which one might expect a considerable supply. But there are several reasons why the farmers' woodlot should not be expected to furnish timber of the kind utilized in the wood-working industries. In order to understand these reasons, we must have some idea of the character of the forest crop and of the character of the forest supplies which we use in these industries. To make logs, we require wood of a certain size and certain quality. In order to produce logs of the required size, the forest crop must have grown from sixty to one hundred years. It is this time limit that makes the forestry business absolutely different from any other business. There is no business that looks ahead a hundred years. This element the farmer will certainly object to in such a crop. He will not want a crop that not even his children will harvest and, perhaps, not his grandchildren. Many are willing to put their funds in the savings bank; but this is a savings bank from which neither he nor his children may withdraw. Nevertheless, it is a very great investment. Wood supplies are everywhere going up. The future will bring high prices, and the farmer who sets aside part of his property as a wood-lot is really laying up an investment that will bring higher interest rates than any others. Within the last fifty or sixty years in Germany, wood prices have increased one and a half per cent per year. In Canada, in the same period timber prices have appreciated up to five per cent.; so that there is some chance of making a good investment by merely allowing the wood-lot to grow up to timber; but, as a rule, people will not be inclined to engage in a business that requires so long a time. However, it is possible to harvest the timber that already exists by proper methods. But just here the difficulty arises that the wood-lot is usually of small size. In order to make the business one of annual returns, it would be necessary to have this condition—that if it takes one hundred years to grow a crop to maturity, it would be necessary to have a hundred acres in forest in order to cut one acre per year. The farmers' wood-lot is hardly as big as this, so

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that the surplus area that he would be entitled to take annually would be too small to amount to anything. It is also a question whether it would pay to move such a product to market. Then, in addition, the isolated position of the wood-lot is inimical to it, as the drying winds, and the destroying winds that make windfalls have access to it. Here are three objections to the farmers' wood-lot as a timber producer.

The question then arises whether it would not be possible to co-operate and locate together several wood-lots and make a real forest instead of a wood-lot; but then it would be a corporation forest. Such forests are beginning to be very much encouraged on the European continent, because under such conditions it is possible to carry on a timber-producing business. In Germany there are a great many communities, villages and cities owning such wood-lots managed in excellent style, so that instead of paying taxes, citizens receive a dividend. A wood-lot "trust," therefore, might not be as bad a business to go into provided you have the land. Mr. Craig indicated that it would be desirable for every farmer to have a wood-lot; I cannot subscribe entirely to that. A man who has a wheat farm from which he can secure good crops year after year would be foolish from a financial point of view to keep a wood-lot.

While, for the several reasons stated, I consider the farmers' wood-lot, so far as the production of wood for wood-working industries is concerned, may be of secondary importance, I consider it of the very greatest importance from the farmers' point of view for several reasons. As Mr. Craig has pointed out, it is desirable for the farmer to have the necessary firewood. I was somewhat astonished to hear him use the figures he did as to the amount of fuel a family in the northern country needs; I had supposed it to be much larger. I should have said that 50 to 75 cords per season might be required. I should like to hear from those who have had experience and have measured their requirements.

A Member: You are nearer to it, I think.

Mr. Craig: I asked half a dozen men who I thought should know, and they said anywhere from 13 to 25 cords.

Dr. Fernow: The way I judge is simply this: I have a farmer to whom I rent a farm and the necessary wood, and he cuts fifty cords to take him through the season.

The President: Twenty-five cords would be an outside figure; of course, this would be the double cord.

Dr. Fernow: Well, my farmer is, perhaps, doing something he ought not to do. Then, the question is, how much acreage should be reserved to supply this twenty-five cords annually. Under good average conditions, in one year the natural increase would be about half a cord per acre; or, under very favorable conditions, it might come up to one cord. In order to get any kind of wood to cut for cordwood you would have to have at least from 25 to 40 year old wood. Hence, you would require about fifty acres of wood to meet your twenty-five-cord annual requirement. In that case you could continuously secure the amount of wood you required.

I am afraid that a good many farmers will wake up some day—if not within reach of other wood-lots or of coal—to the fact that they have not provided for the future. Hence, it is now time to figure how you are going to treat the rest of your wood-lots in reference to a continuous supply, not only for yourselves, but for the owner of the farm in the future. There will be a time when the wood-lot will sell the farm, or will be a necessary part of the farm to make it valuable. I have already stated that timber will grow on lands that are not fit for agricultural purposes. Trees, first of all, do not rely upon the fertility of the soil. Perhaps this is new to many of you.

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The agricultural crops take mineral constituents from the soil, which must be replenished by cultivation and fertilization. Timber crops do the opposite; they make the soils fertile. Trees grow with their roots deep down in the soil, and whatever minerals they secure from the soil are returned to the surface of the soil by the foliage and twigs, provided you do not burn them up, and even then a large part still remains. Hence, forest crops are really fertilizers. You may, for instance, in a farm which is not rocky, grow your timber on one lot, and then remove from that lot and refertilize the one you have just left by planting it in trees. Therefore, the proper location of the wood-lot is the first question; locate it on the portion of the land you cannot use for anything else—on the thin soil or poorly drained. Then it will give certain advantages in the way of a wind-break, so that it should be located with reference to your crops. It may be located on the tops and sides of the hills. All the broken portion of the farm should be under trees. Every foot of ground in the Old Country is utilized for the purpose for which it can best be utilized. In addition to that, every hour of the year may be utilized for labor. There is the advantage that most of the forest work falls in the winter time, when other farm work is slack. I have sometimes wondered whether any other business but farming would permit a man to work hard for six months, and then sit still for the other six; yet this business of farming pays as well as any other business.

I do not believe in the wood-lot as a producer of timber material, and the farmer will probably do best to confine himself to producing simply the fuel consumed and the small timber he needs for repairs at home. That he can probably do best by turning his wood-lot into a coppice, seeing to it that a reproduction comes from the sprouts and from the seeds.

As to the manner in which a wood-lot should be treated, there are so many different conditions in which a wood-lot may be found, that I shuld be like a quack doctor if I attempted to give you information that you could at once apply. There are a few general principles, perhaps, that I might bring out. I understand that hitherto farming has been largely a mining operation. That is to say, the farmer has gone into the land and taken out the fertility he found there. In reference to our forest wealth, at any rate, it has been nothing less—simply to go into the native woods and pick out all the pay ore. Having taken out the best kinds, we have the weeds left on the ground. He has not even protected this, and instead of having a valuable piece of woods, we have a weed crop. But we will take it for granted that all the good things have not gone yet. Many farmers have good trees left. The first thing, then, to do, if you want to systematically manage your wood-lot, is to go in and do the improvement cutting, improving the composition of your present crop, so that when it comes to reproducing, the good things will reproduce. First of all, you must go in and cut out the culls and the poor material. This weeding process is everywhere the first one to be gone through. When you have in that way changed the composition of the lot—have chosen only those species that are worth while protecting—hardwood timber—then you may go in and cut for the future. This is the difference between the lumberman, the farmer, and the forester; the point of view is different. In the first two cases, a man wants to take only the best; in the other case, he also wants to take the best finally, but first he wants to see that the best is able to reproduce itself.

In attempting to improve my wood-lot, then, I would first go to work systematically, taking one part by itself; then take the next part, and so on; and then go over the whole area, thus gradually changing its present condition, leaving only the valuable varieties. When this is done we should go to work to reproduce those varieties. We can then choose the length

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of time that it is desirable to allow our timber crop to grow. Experiments will teach this. We ought to realize that wood grows at a different rate from year to year. At first it grows very slowly ; then it rises very rapidly ; then comes a time of maximum production ; then it diminishes to its lower rate. That is one reason why it takes so long a time to grow timber. Another interesting thing is that each species grows almost as much wood in weight per acre as any other species ; but it is the difference in volume. Some wood is heavy, and some light. The heavy variety will grow you a small amount of wood per acre in volume, and the light wood the reverse. So there is some investigation to be made to find out when the maximum production is brought about. In Ontario thirty years may be sufficient. It will be sufficient for firewood.

Q.: At what age does the white pine reach its maximum production ?

A.: The maximum growth in volume will be in thirty or forty years ; but the maximum value will be at a much longer period. Then you want to be in such a position that each year you can get thirty-year-old wood. After that you will have to continue to improve your wood-lot so as to secure the species of wood most valuable. You will then have to study the difference of light-needing and shade-needing species. We have species that need a great deal of light, like the white pine. Study the requirements of light and shade, and then begin to thin out. Of course, I cannot begin to go into details, but I will say this much : There is a little Farmer's Bulletin published in our country by the Department of Agriculture at Washington ; it is No. 67—"Forestry for Farmers." You will find in very simple language the reasons for doing this and that. Then you must supply your own judgment as to how you are going to apply the principles in your particular case.

I am a thorough believer in the proposition that everything we have should be used to its utmost ; and this relates to the farmer's wood-lot, to the forest, and to the farm. There are very few farms but have parts that could be used to advantage for timber culture. There is also an advantage that is often not appreciated, and that is the beauty of the surroundings. This is appreciated by the farmers on the plains, but seldom by farmers in a wooded country. I know of a farm in Iowa that sold because the owner had planted a grove there ; it was not worth anything, but it improved the looks of the country.

Mr. Thomas Southworth, Director of Forestry, Toronto : It has been said that you will convince the farmer much more readily that certain things are wise if you can show him a dollar in it. The recent scarcity of fuel owing to the strike of the coal miners has called attention to the question of fuel production very forcibly, and I think it is a good time to induce farmers to discuss this question of wood and wood production. The Ontario Government has for some years issued bulletins pointing out the danger that is likely to arise because of the too great clearing of farm lands, but without attracting much attention or arousing much alarm. It is now to be hoped that when it can be shown that we can improve the climatic conditions and moisture conditions by a greater proportion of wood-land, and that such wood-land will make more money for the farmer, it will, perhaps, assist in restoring a condition of things that would be wise. As I understand it, the safety of a country like this is based on assured crop production—the matter of soil-moisture, prevention of destructive winds, etc.—and that in order to secure this, there must be about twenty per cent. of our total area in wood. While we have that percentage in Ontario as a whole, it does not exist in the settled part of the Province. In this county, for example, there is only about 9 per cent of the total area in wood. Those who have tried unsuccessfully

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to grow fall wheat, owing to the drifting of the snow from the fields, will understand what this means.

I understand that one of our agricultural papers has taken up the question of the farmers' wood-lot to a considerable extent, and has published a large number of letters from its correspondents which are of much interest. Practically every one of them bears on the question of the production of wood for fuel, without any regard to another aspect of the question, which I think is equally important. I was directed by the Commissioner of Crown Lands a year ago to make some enquiries in some of the States of the Union as to legislation that had been placed on the Statute book with the view of restoring cleared land to wood land. Several of the States have legislated in this direction with more or less success, and I have been asked to submit for the consideration of the Government some legislation for Ontario to encourge the planting of trees and increase the wood-lot area. I have to frankly admit that I do not consider myself competent as yet, or sufficiently advised as yet, to submit legislation that I think would be effective and wise ; and for that reason I should be very glad to receive suggestions from the members of the Union. It has been suggested, and, I think, wisely, that some remission or reduction of taxes on wood-lots would be in order. According to the present system, it would appear that if a man allows his wood-lot to increase, the assessor jumps up the assessment on that particular lot. Naturally, the farmer is not encouraged to increase his wood area. I find that this practice is quite frequently followed. It has also been suggested that a bonus should be given for the planting of certain areas of rough land on the farms. The farmers know very well that much of the land left in pasture that is hilly would be more profitable in wood than as pasture ; but the difficulty is to get it in wood. When the farmer has to transplant trees, it is a slow operation ; and should he attempt to buy trees from nurseries, it is expensive. It has occurred to me, therefore, that it would be wise if the proposed legislation took, in any case, the form of assistance or encouragement either by the reduction of taxation or the changing of the assessment laws which would permit of that reduction ; and that it should also be in the form of supplying seedling trees. We can, of course, put the soil in condition to sow tree seeds, but it seems to one who has not had much experience with it that it is a very slow process. But it might be possible to supply seedling trees to farmers who would agree to plant certain areas, either free or at a very low price. We might possibly use the machinery of the College, which is already doing good work in connection with Farm Forestry, in growing seedling trees. It would not require a very large area. I merely make that suggestion, with due deference to the Minister of Agriculture, who, I expect, will object to putting more work on the Farm at Guelph. I think that trees of sufficient size for transplanting to the farm could be grown at a cost of $1 to $1.50 per thousand.

Mr. W. T. Macoun : I think that the plan of actively co-operating with the farmers is a good one. The work the Dominion Government is doing in Manitoba and the Northwest is, I think, being well done. Mr. Ross, who has charge of that work, is present, and will doubtless give us an outline of what is being accomplished. If some such work could be undertaken here, great good would come of it. I believe that in the discussion of this question we should first direct attention to some of the immediate changes that a farmer should make in his wood-lot—changes that may be made by himself. One of the most serious causes of injury to the wood-lot is the destruction of the young growth by the cow. This should be prevented by fencing off the wood-lot, thus giving the young growth a chance. We are doing some work in forestry at the Experimental Farm at Ottawa. We planted our first

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trees in 1887. Since that time we have interested many in the planting of trees, and have ourselves learned many things in connection with them. One of the things we have learned is that it is very expensive in planting to plant trees from five to ten feet apart. We had to cultivate our trees for many years before they protected the ground with shade, and if we had not cultivated them in the meantime, the trees would have made very little growth. Some kinds, of course, cover the ground much more quickly than others. Probably the best result we have had is from about an acre of evergreens. This plantation was a nursery in 1887, and was allowed to grow up. The trees were only one foot apart, and the rows three feet apart. Many people thought we were going to ruin the trees, but it is the best piece of plantation we have. The trees are perfectly straight, and clean up to twelve feet in height. This year we cut a large number of poles from the Scotch pine. I think this is going to be a valuable tree in some parts of Ontario. It will make a greater growth on a greater variety of soils than will the white pine. We have grown it on undrained, poor, cold soil, and on the best soil, and find that it does almost equally well on all kinds. Of course, it is not as valuable as the white pine. Another thing we have learned is that black walnut will not succeed with us unless planted on warm soil. It makes very little growth in cold soil. It is perfectly hardy, and succeeds as far north and east as the city of Quebec. We have in our plantations trees planted in various ways; in some parts they are in blocks of individual species; in another plantation we have mixed trees. On the whole, we find that the latter succeed much better; but if we did not look after them, the better kinds would in many cases be smothered out by the others. We therefore have a man go around in the middle of the growing season, when he can see the trees best, and lop off the tops of the poorer varieties, allowing the leader of the more valuable trees to get ahead. The white pine, if given a chance in this way, will make very rapid growth. The trees kept back are principally the box-elder and birch. During the last three or four seasons I have been planting trees two and a half feet apart each way. I believe this is going to be the most satisfactory way in the future. By doing that, you can stop cultivation after the second season, and the trees will look pretty much after themselves. For permanent planting, we have used white pine, white ash and hard maple. The idea is that the white pine will be there for a hundred years or so, the white ash will be profitable in twenty-five or thirty years, and the maple will keep the ground shaded in the meantime and be profitable later on. I do not know how this will work out, but we are trying it. I should like to impress upon farmers who are undertaking to plant trees, to plant them close. If you plant five or ten feet apart, unless you cultivate, your trees will make little growth; and if you cultivate, the expense will be too great.

The President: Would not that block the way invariably? You are proposing to replant the barren, useless portions of the Province. Many such portions are dry, rocky hills. If cultivation is a necessity, what could you do under such cirumstances? Around here, for instance, there are many rocky and sandy hills; is it possible to plant trees there and have them thrive with any reasonable expenditure for planting and care?

Mr. Macoun: Yes; if the trees are planted close, and you plant strong kinds, like the dwarf willow. They will usually cover the ground the first year, or entirely the second year.

Q.: You plant these as protection for better varieties?

A.: Yes; that is the idea.

Q.: Then the better kinds would grow without cultivation?

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A.: Yes. If you planted trees early in the spring on such land, the roots would get down sufficiently not to die out.

Hon. Mr. Dryden: I should like the privilege of emphasizing one point. I have had some experience on my farm in preserving the wood-lot. If the farmer has a fair average wood-lot, there is no difficulty in preserving it for all time, unless he cuts too much of the timber. Thirty years ago my father, after having cleared the farm of most of its timber, saw the importance of preserving a strip at the north end of the farm. We have there to-day about thirty acres. The animals were not allowed to get into it at all. The result was that the undergrowth quickly grew up, and to-day it is full of timber. Trees that were small when he purchased the property are now sufficiently grown for firewood, and they still keep growing up. It is now so thick that the cattle do not care to run in it, but merely browse on the outskirts.

I think the farmers generally will agree that one of the worst things they have to contend with is the severe wind storms in different parts of the country. We have had this trouble. The best protection against them is to allow the undergrowth to grow. If you allow cattle to destroy it, it would seem that the roots have not the same hold on the ground. We find that in the portion of the wood-lot where the undergrowth is strongest, the fewest of the older trees blow down.

With reference to Mr. Southworth's suggestion as to the best way of inducing farmers to plant trees, there are many difficulties in the way. The farmer will say: Well, if I do plant timber on that land, what am I going To get off it? What return am I to receive for that portion of my farm? The answer will be: Nothing in your lifetime, and perhaps not much in your son's lifetime. If you are to succeed in inducing the farmers to plant wood-lots, you will have to give them some encouragement. Farmers are peculiar—though perhaps they are not very different from any one else—you can induce them to do what they would not otherwise do by manifesting interest in their welfare. If the farmer realizes that you are doing something for the benefit of the country as well as for his special benefit, and that those in authority are willing to render some assistance, you will find that little by little he will proceed in the desired direction. Doubtless the trees will have to be produced somewhere, but so long as I am here they will not be produced at the O.A.C. The Department of Crown Lands, which Mr. Southworth represents, has any amount of territory in this Province worth only fifty cents per acre. I should like to see them proceed to some of these lands, where they will have all the privileges, and trees, and everything necessary to produce timber, and show what they can do there. We have our hands full here at the College, and have none too much room as it is. This would be a big undertaking. I do not know whether Mr. Southworth has studied it out, but I judge you would require a considerable amount of land if you are going to grow trees for the farmers. I like the suggestion. I believe that if we can say to the farmers, "The Government will provide you with trees if you will undertake to properly plant them," you will find that a great deal of enthusiasm would be aroused in the country in connection with forestry.

Mr. Thos. Southworth: May I express my delight at the approval of the Minister of Agriculture of the suggestion to supply farmers with seedling trees. We do not want the whole farm for the purpose, as we propose to grow the trees only until they are about a year old. I think we could grow a couple of million trees on about two acres. We do not require to go to the north country to get two acres of land. Another thing: We have not the skilled staff; we have lots of land, but not the staff.

Mr. Dryden: That is what I thought; there is some work about this, and, therefore, they will put it on the Farmers' Department.

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Dr. Fernow: As a part of our demonstration in connection with the College of Forestry, we have thirty thousand acres to manage. That is old timber, together with slash, etc. The plan I aim for is to dispose of the old material, because this is the crop which must be harvested. Unfortunately, the lumberman wants, first, to take the cream, and we are working with skim milk. We are selling ten thousand acres per year, or about two and a half million feet of logs, so that you will see it is no small operation. We are trying to reconstruct that thirty thousand acres from a hardwood forest to one of coniferous trees with whatever hardwoods that will establish themselves. To establish this, we have two two-acre nurseries, in which we grow about three million plants of pine and spruce. These trees grow slowly, and require three years before transplanting. In deciduous trees, you can increase the number considerably. In locating a nursery it is very important that you should be near a railway station. That is the first consideration in a distributing point.

I am heartily in favor of this proposition of Mr. Southworth's. It has been tried in the Old Country with very great effect. With reference to admitting cows to the woodlot, a very important point to remember is that they tramp the soil and compact it so as to prevent seed from growing. As regards methods of planting, I am afraid two and a half feet apart is rather close. I remember very well that when the experimental plots were laid out at the Ottawa Farm, I objected to the close planting, and said that they would find that three feet apart would be more satisfactory if they wanted to grow superior trees. We plant right in the slash, without any preparation of the soil, among the brushwood and fallen timber, because it is too expensive to do anything else. We plant at the rate of a thousand to fifteen hundred plants to the acre, which would average six feet apart. It is not the best plan, and the farmer can plant three feet apart, using 500 expensive trees to the acre, and the balance less expensive trees for soil cover. As to methods of assisting the farmer, none have been proposed that have not been tried, and the right thing to do is to investigate them in the places were they have been tried and learn why they have been failures. In most cases they have been failures. In 1863, I suggested enacting laws to encourage tree planting. In some cases this was afterwards done, and either taxes were remitted or bonuses paid, and finally the Government gave land and distributed plants. But it may be done successfully, and the thing is to find out under what conditions it was made successful. The distribution of plant material alone is not sufficient. You will have to have some one go around to show how to plant, as it is not well understood. A great deal of failure was due to ignorance in planting. As to the remission of taxation, I am a very democratic man, and do not think that any man should be favored; we should all be treated alike; and I am not ready to recommend a relaxation of taxes. It seems to me a fair thing, however, that, with a crop like a forest crop, some difference in the manner of assessing should be provided. As long as the crop is bringing you nothing, you should be put to no expense. When you begin to cut it, then is the time to tax. This is accepted in some parts of Germany as the proper basis for taxing forest crops. They usually divide the tax into two parts: first, the land, and then the accumulated capital which is in your wood growth. When your timber is 100 years old, a large amount of wealth has accumulated; when you change that investment into cash, the tax gatherer is entitled to a share. We have several such laws, one in Pennsylvania and one in Indiana; most foolish. I beg of you to read them and avoid them. The giving of a bonus has been tried in some States and led to nothing else but the withdrawal of cash from the treasury. The bonus was not large enough, and the planting cost more than the bonus. The distribution of plant

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material, combined with proper information as to how to handle it, appears to me the most sensible method of reaching the question. I think that without any preparation of the soil, providing the planting is properly done, it is possible to raise timber at small expense. We have been experimenting with that under very unfavorable circumstances, planting only conifers, using unskilled Franch-Canadian labor, better able to cut trees than to plant. It costs us between five and ten dollars per acre to make a satisfactory showing. The farmer who grows his own stock, and it is as easy to grow as cabbage, can grow it at the rate of $1 or $1.50 per thousand; in other words, $2 per acre for the plant material. He could plant an acre for another $2; so that, allowing for time in planting, it would cost him about $5 per acre where you plant everything. If he already had a wood-lot and wished to plant at the rate of 500 trees to the acre, it could be done for about $3 per acre.

Dr. Mills: Do you think it is possible to grow without cultivation? Could you plant in sod?

A.: No; that would be improper. The best way would be to have a two-share plow, and open up a furrow every four, five or six feet, and set your plants in the furrow three free apart. After about ten years they will grow up and begin to make good timber.

Q.: Would you allow the grass between the furrows to remain?

A.: Yes; because all that is necessary is to prevent the encroachment of grass for two or three years. When the plant is established and has its root firmly in the soil, it does not matter.

Q.: That supposes good land that you could plow?

A.: You may have to do it with the harrow in spots. Take a broad harrow and take off the sod, and plant in spots here and there.

Mr. Zavitz: Thirty years ago my father fenced off a wood-lot and kept the cattle out, and to-day it is a beautiful woods of nearly all maple. The trees came up thickly nearly all over. In the weak places we planted locust trees. If a similar custom were adopted all over Ontario, we should not have much fear for the future. In Germany I passed through immense forest plantations, eighty or a hundred years old, and could not help being impressed with the fact that we in this country know very little about forestry. I visited one or two forestry schools near Berlin where they take up nothing but forestry. The main building at these institutions is divided into class rooms, and a museum devoted to different kinds of woods, implements of the forester, and insects destructive to the trees. Outside they have a forest plantation of two or three acres growing young saplings for transplanting. It was not an elaborate or expensive institution, but just met the purpose. If we had similar facilities in connection with the College it would do an immense amount of good. One of the crying needs is to impress the farmers with the necessity of improving and preserving their wood-lots, and then to let them know how to do it in the best way. We have thirty or forty thousand farmers coming here every year, and a school like that established here with its plantation and museum would serve as an object lesson to them. I believe there is no better way to increase enthusiasm than such a system. I do not see why there should not be a permanent course of training in forestry at this institution. I am not an authority on forestry, but wish to bring these two observations before the meeting.

Mr. G. C. Caston: I do not think we have taken up this important question any too soon. There is one phase of the matter to which I should like to call attention. A good deal of the land in the northern portion of our Province, which was originally pine land, has now been denuded of its pine and left unimproved. It is not suitable for agriculture. As it is, it is a national loss. Could not that land be expropriated and replanted with valuable species? I

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do not agree with those who claim that we do not owe posterity anything. That is a phase of the question that ought to be considered. Most of us whose memories go back thirty or forty years are amazed at the rapidity with which the forest has disappeared. There is also another aspect of the question: Prof. Reynolds issued a bulletin last summer which struck me as containing a most logical reason for the destruction of farm property by lightning. He attributed it to the clearing away of the woods. Formerly the woods presented a large surface for conducting the electricity to the earth. Two years ago five splendid barns were destroyed between Listowel and Guelph during one thunder storm, thus entailing tremendous loss.

N. M. Ross: My experience with eastern conditions is very limited. I have had charge of the free distribution of trees to the settlers in the West. We have had nurseries for two or three years at the Experimental Farms at Brandon and Indian Head, and from there the distribution is made. Enough trees are given to plant from half an acre to two or three acres. Before the trees are given to any of these men, the ground they intend to plant is inspected to see whether it is fit for growing trees and to see what trees are best adapted to the soil conditions. Instructions are given with the trees as to how to plant, and from year to year the plantations are visited to see that they are being properly looked after. If they are, additional planting material is given. I think that the suggestion to establish a nursery in connection with the College is an excellent one. There is a scheme, I think, on foot to establish a Forestry School here. I do not think there is anything that tends more towards an education in forestry than knowing how to grow saplings. There is no better means of collecting data on the financial and other aspects of forestry than the Experimental Union, which you already have established. The committee on Forestry should, I think, set to work to obtain data on these points and as to rates of growth, species best suited to the different districts, etc. This information cannot be obtained in a short time, but any work in connection with forestry must necessarily extend over a long period of time.

Mr. Mason: If fire is kept off lands from which the timber has been cut, will they reclothe themselves?

Dr. Fernow: Yes, of course; but the white pine will grow only where the openings are large enough to allow it to get light. It is a light-requiring species.

THE EVOLUTION OF THE FOREST.

By Dr. B. E. Fernow, Director College of Forestry, Ithaca, N.Y.

The wealth of the world lies in the soil. The bowels of the earth furnish some of the necessities of life from quarries and mines, but finally, most of the primary commodities—foods and fabrics—are products of the soil, directly or indirectly.

Certainly the most needful commodities—food products and dress—as well as those most widely used—wood products for fuel and construction—are derived from the soil.

Again, by far the largest share in the diversified occupations of men, in the means of employment and in sources of wealth, comes more or less directly from the soil.

Mills are built to transform the direct and indirect products of the soil into readily available breadstuffs, dressstuffs, and materials for implements and structures; means of transportation are developed, mainly to facilitate traffic and exchange in these products of the soil; machines are invented and

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operated largely to effect this transformation, and manufactories are established to build the machines and devices used in the pursuit of securing the products of the soil, in the preparation of foods and fabrics, and of materials to be used in the erection of mills and in the traffic which results from the products of the soil. Indeed, the mines are opened and their products transformed into useful materials mainly or largely for the purpose of these various industries connected with the handling and trasforming of these products of the soil.

All the great diversity of activities, of industries, of commodities, of sources of wealth which characterize the modern civilization and give employment to the millions have their origin more or less directly in that primary source of wealth and comfort, nay of life itself, the soil. And next to it stands water: "Water is the best thing," sang Pindar of the Greeks.

But without soil to use it, it is of little avail. And yet again, soil without water to support useful plant production would be empty treasure, for it is water that makes the soil available. So intimately are soil and water connected that the one cannot be dissociated from the other. Just as in a chemical compound, inert and separately useless or obnoxious elements combine to form active, most valuable and beneficial bodies, so does water and soil impart, each to the other, its value by their combination.

Soil and water, then, are man's richest treasures, and if he be rational he will guard them more than any other sources of material wealth and use them with discretion,—yet in all countries and in all ages, man has been careless and wasteful of these most important bases of his well-being. He has squandered them lavishly, has allowed them to dissipate, and to slip away or to be destroyed, seemingly in utter ignorance of their important bearing; whole peoples have been impoverished, practically wiped out through mere neglect or abuse of these primary sources of wealth, and through ignorance as to the conditions and relations influencing their preservation.

"Man goes over the earth and leaves a desert behind him!" "Precisely that portion of the earth's surface which about the commencement of the Christian era was endowed with the greatest superiority of soil and climate is now completely exhausted," says Geo. P. March, in his classic volume, "The Earth as Modified by Man." "A territory which in bygone centuries sustained a population scarcely inferior to that of the entire Christian world at the present day has been brought into desolation almost as complete as that of the moon."

Nor is this destruction of naturally favorable conditions confined to that portion of the earth and that era. We can trace it over the globe and through all ages, progressing only less intensely and now arrested here and there by intelligent man.

It has been reserved for the present era, with the development of natural sciences, to find and appreciate the reasons for this loss and deterioration of our great sources of wealth; and finding the reason, to suggest the remedy and prevention of further loss.

We have learned only in modern times to appreciate that all things are in relation, that, therefore, we cannot take away anything from the complex conditions of nature, that we cannot destroy or modify one condition without affecting more or less all other conditions.

With regard to the soil, we have learned that its stability and its fertility are in most direct relation to the water conditions and the topography of the land. But a third important factor that enters into the problem of the conservation of the soil and water is its cover. This was perhaps most definitely expressed by that great exponent of natural philosophy, A. V. Humbo'dt, when he exclaims in his Cosmos: "How foolish does man appear in de-

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stroying the mountain forests, for thereby he deprived himself of wood and water at the same time;" and he should have added : Of soil also !

The importance of the forest cover of the earth has only lately been fully realized, not only as a furnisher of a material most needful to civilization, next to food, but because of its relationship to soil and water conditions.

With the increasing need for food supplies, the necessity for increase in farm area has reduced the forest area : the virgin woods have had to give up their stores until the natural supplies are waning, and recognition has come to nation after nation that care has to be bestowed in the use and propagation of this important source of wealth and civilization, in other words, that forestry must be practised.

In order to practise forestry, there is, first of all, need to understand the natural history of the forest. How does Nature produce her forests ? What are the laws, what is the progress in the evolution of a forest growth? These questions I shall endeavor to answer to-night.

The earth may be said to be a potential forest. A cover of tree growth more or less dense is, or has been, the natural condition of at least the larger portion of the inhabitable earth, and of the entire land surface, not less than 60 per cent. may be classed as actual or potential woodland; 7 per cent. prairie; and 33 per cent plains or barrens. (U.S., 45-5-50; Asia, 45-3-52; Europe, 84-10-6.)

In the struggle for existence and for occupancy of the soil between the different forms of vegetation, tree growth has an advantage in its perennial nature and in its elevation in height above its competitors for light, the most essential element of life for most plants. These characteristics, together with its remarkable recuperative power, assure to the arborescent flora final victory over its competitors, except where climatic and soil conditions are not adapted to it.

The entire absence of tree growth from some localities, such as the northern tundras, the high peaks above timber line, and the arid plains, is due to temperature, moisture, and soil conditions, either one or the other, or the unfavorable combination of them. On the high peaks, the two characteristics of perennial life and persistent height growth become unfavorable, since the extreme winter temperatures above the snow cover, droughty winter storms, and frosts every month in the year can be endured only by those plants which have a rapid cycle of development, or are sheltered near the ground by the snow cover. The wet soil of the tundras, frozen for most portions of the year, just as the thin soil on the Alpine peaks, adds to the difficulties for deep rooting species in their contest with the lower vegetation. Again, in the interior of the continents and other localities unfavorably situated with reference to the great sources of moisture and moisture-bearing currents, deficiency of water, scant rainfall, low relative humidity, or both, and excess of evaporation are inimical to tree growth, occasioning plains, which although not always and by necessity treeless, do not permit any forests to establish themselves unaided.

Occassionally, soil conditions, especially with reference to drainage, may be more favorable to the graminaceous vegetation, at least for a time ; giving rise to pampas, prairies and savannahs, or else all the unfavorable conditions combine to give rise to deserts.

In addition, there are hostile agencies in the animal world, which prevent the progress of forest growth and tend to preserve the prairies ; locusts, rodents, ruminants, like the buffalo, antelope and the horse, impede the growth and the spread of trees, and especially where compact soil and deficient moisture conditions are leagued with these animals, the change from prairie to forest is prevented, at least for a time.

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Woodlands are the most unfavorable form of vegetation for the life of ruminants, and, therefore, for the support of the largest number of men. For food production, for agricultural pursuits, man must subdue and remove tree growth. Hence, forest devastation, forest destruction, is the beginning of civilization in a forested country, its necessary requisite; and the persistency with which, in forest regions, the forest tries to re-establish itself calls for continued effort to protect pasture and field against its re-establishment.

So impressed was Dr. Asa Gray with the persistency of individual tree life that he questioned whether a tree need ever die; "For the tree (unlike the animal) is gradually developed by the successive addition of new parts. It annually renews not only its buds and leaves, but its wood and its roots, everything, indeed, that is concerned in its life and growth. Thus, like the fabled Aeson, being restored from the decreptitude of age to the bloom of youth, the most recent branchlets being placed by means of the latest layer of wood in favorable communication with the newly-formed roots, and these extending at a corresponding rate into fresh soil,—why has not the tree all the conditions of existence in the thousandth that is possessed in the hundredth or the tenth year of its age? The old central part of the trunk may, indeed, decay, but this is of little moment, so long as new leaves are regularly formed at the circumference. The tree survives, and it is difficult to show that it is liable to death from old age in any proper sense of the term."

However, this may be, we know trees succumb to external causes, insects, fungi, fire, windstorms, etc. Nevertheless, they are perennial enough to outlive aught else, "to be the oldest inhabitants of the globe, to be more ancient than any human monument, exhibiting in some of its survivors a living antiquity, compared with which the mouldering relics of the earliest Egyptian civilization, the pyramids themselves, are but structures of yesterday." These dragon trees, so-called, found on the Island of Teneriffe, off the African coast, are believed to be many thousand years old. The largest is only 15 feet in diameter and 75 feet high. Our Sequoias, or Big Trees, are more rapid growers, and attain more than double these dimensions in 3,000 to 4,000 years, which may be the highest age of living ones. Their long life is undoubtedly due to the fact that they are not liable to attacks by insects, fungus, and hardly by fire.

While this persistence of life is one of the attributes which in the battle of life must count as of immeasurable advantage, the other characteristic of arboreal development, its elevation in height above every living thing, is no less an advantage over all competitors for light, which is the source of all life; and in this competition, size must ultimately triumph.

Endowed with these weapons of defensive and offensive warfare, forest growth has endeavored, and no doubt to a degree succeeded through all geologic ages, during which the earth supported life, in gaining possession of the earth's surface.

As terra firma increased, emerging in islands above the ocean, so increased the area of the forest, changing in composition, to be sure, with the change of physical and climatic conditions.

As early as the Devonian age, when but a small part of our continent was formed, the mud flats and sand reefs, ever increasing by new accumulations under the action of the waves and currents of the ocean, were changed from a bare and lifeless world above tide-level to one of forest-clad hills and dales with quaint forms, like the tree rushes and the prototypes of our pines, the Dadoxylon.

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The same class of flowerless plants, known as vascular cryptogams, with colossal tree ferns, and the Sigillarias added, became more numerous and luxuriant in the Carboniferous age.

This vegetation probably spread over all the dry land, while other forms made the dense jungle in the marshy places and lakes with floating islands; the thick deposits of vegetable remains from these forests were finally, in the course of geologic revolutions, turned into the great coal fields.

During these geologic revolutions some of the floral types vanished altogether, and new ones originated, so that, at the end of Mesozoic times, a considerable change in the landscape is noticeable. In addition to coniferous trees, the palms appeared, and the first of Dicotyls, such as Oaks, Dogwood, Beech, Poplar, Willow, Sassafras, and Tulip tree. Species increased in numbers, adapted to all sorts of conditions, the forest in most varied form and luxuriance climbed up the mountain sides to the very crests, and covered the land to the very poles with a floral of tropical and semi-tropical species in profusion, and large mammals roamed over the open spaces.

Then came the levelling processes and other changes of post-Tertiary or Quaternary times, the glaciation of mountains and northern latitudes, with the consequent changes of climate, which brought about corresponding changes in the ranks of the forest, killing out many species around the north pole, the hardier races alone surviving; and these were driven southward in a veritable route by the icy blasts.

When these boreal times subsided in a degree, the advance of the forest was as sure as before, but the battle order was somewhat changed to suit the new conditions of soil and climate. Only the hardiest tribes could regain the northernmost posts, and of those who followed, many found their former places of occupancy changed by fluvial and lacustrine formations and by the drifts borne and deposited by icy sheets, while some by their constitution were entirely unfitted for engaging in a northern campaign, or found unsurmountable barriers in the refrigerated east-west elevations, as in Europe and Western Asia.

In addition, there has come new troubles from volcanic eruptions, which would again and again wrest the reconquered ground from the persistent advance guards of the arboreal army, annihilating them again and again.

Finally, when the more settled geological and climatic conditions of the present era arrived, and the sun arose over the world ready for human habitation, man found what we are pleased to call the virgin forest—a product of long-continued evolutionary changes—occupying most, if not all, of the dry land, and ever intent upon extending its realm.

I may not leave this prehistoric story of the battle of the forest without giving some historic evidences of its truth. Paleobotanists have unearthed the remnants of the circumpolar flora, which gives evidence that it resembled that of present tropic and semi-tropic countries; they have also shown that Sequoias, Magnolias, Liquidambars, and Hickories existed in Europe and on our continent in regions where they are now extinct. We have also evidences of the repeated successes and reverses of the forest in its attempt to establish itself through long geologic transformations.

One of the most interesting evidences of these vicissitudes in the struggle of the forest to establish itself is presented in a section of Amethyst Mountain in the Yellowstone Park, which exhibits the remains of 15 forest growths, one above the other, buried in the lava. Again and again subduing the inhospitable excoriations, again and again the forest had to yield to superior force. The face of the mountain, here schematically represented, includes over two thousand feet of strata resting upon granite. The trees, or rather parts of them, stand upright and lie prostrate in good preservation,

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40 to 50 feet in length, and not a few as much as 5 and 6 feet in diameter. (Note the ancient and modern vegetation in company.) The largest uncovered by the action of water and soil movement, rising 12 feet above the inclosing strata, is 10 feet in diameter and belongs to the Sequoia tribe.

Among these petrified witnesses of former forest glory, Magnolias, Oaks, Tulip trees, Sassafras, Linden, Ash have been identified accompanying the Sequoias, while now only the hardiest conifer growth of pines and spruces finds a congenial climate here.

Reversals of this kind are taking place even in our own time, before our very eyes. In Alaska, and elsewhere, glaciers carry large masses of soil and rock, depositing it in moraines at lower levels. On these moraines, vegetation soon establishes itself, and finally the forest grows to the very edge, nay, upn the very back of the mighty sheet of ice. But as the ice river ebbs and tides, recedes and pushes forward, the existence of the forest cover is precarious and of temporary duration. Sooner or later it will be pushed over by the moving ice and buried by the moraine material. Again receding, the glacier river carrying off the melted ice in a rapid stream, this stream cutting through the moraine, may uncover the buried forest, as in the case near the celebrated Muir glacier, exhibiting to us a bit of the earth's history and of the methods of making it, and the forces at work in past eras.

Just as the forest formed and spread thus during the course of ages, so does it form and spread to-day, unless man, driven by the increasing needs of existence, checks its progress and reduces its area by the cultivation of the soil. This natural extension of the forest-cover takes place readily wherever soil and climate are favorable, but it is accomplished just as surely, though infinitely slower, in unfavorable situations. On the naked rock, the coarse detritus and gravel beds, on the purely siliceous sand deposits of rivers and ocean, or in the hot, dry plains, the preliminary pioneer work of the lower vegetation is required. Algae, lichens, mosses, grasses, herbs, and shrubs must precede, to cultivate the naked rock, to mellow the rough gravel beds, to make the soil, to increase the soil moisture by shading the ground and gradually render it fit for the abode of the forest monarch. The army of soil makers and soil breakers, the pioneers, as it were, of the forest, are a hardy race; making less demand for their support than those who are to follow. They come from different tribes, according to the climatic conditions which they have to combat. As soon as they have established themselves, they begin their cultivatory activity, which consists in withdrawing from the rock or soil and from the air the nutritive elements, returnng them to the soil when they die and decay in a form much more suitable for the support of the higher plants. Not only are thus, by the repeated growth and decay of these pioneers, the nutritive elements of the soil improved and augmented, but also the physical properties; the soil is deepened and becomes mellow, and its capacity for moisture increases. The waters, charged with carbonic acid derived from the decay of the vegetable humus, hasten the decomposition of the underlying rock, and thus also the fertile soil layers increase, until the more fastidious plants can subsist. The humblest workers, algae, lichens, cacti, and mosses are followed by sedges, dry grasses, herbs, and shrubs, or, in the drier and warmer climates, agaves and yuccas; then come ferns and other representatives of the lower vegetation, succulent grasses, and herbs, gradually covering the soil with a meadow or prairie, the shrubs become more numerous, by degrees closing up, shading the ground and overshadowing the grasses, and finally the time is ripe for the arborescent flora. Single trees, stragglers, or skirmishers in large numbers, and shrub-like and Nor does then the forest appear at once in its fulness and variety of form. stunted forms first arrive, gradually increasing in number and improving in

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form. These, by their shade and by the fall and decay of their foliage and litter, improve the soil for their betters to follow.

The Aspen is one of these fore-runners, which, thanks to its prolific production of light, feathery seed, readily wafted by the winds over hundreds of miles, readily germinating and rapidly growing under exposure to full sunlight, even now in the Adirondacks, the Rocky Mountains, and elsewhere, quickly takes possession of the areas on which man has ruthlessly destroyed all vegetation by fire. This humble, ubiquitous, but otherwise almost useless tree, is nature's restorative, covering the sores and scalds of the burnt mountain side. Though short-lived, with its bright summer foliage turning into brilliant golden autumn hues, it gives grateful shade, and preserves from the thirsty sun and wind some moisture for the better kinds to thrive and take its place, when it has fulfilled its mission.

In other regions, as on the prairies of Iowa and Illinois, hazel bushes, or, in the mountains of Pennsylvania and the Alleghenies in general, ericaceous shrubs, like the Laurels and Rhododendrons or Hawthorn, Viburnum, and Wild Cherry, are the first comers, while along the watercourses Alders and Willows crowd even the water into narrower channels, catching the soil which is washed from the hillsides and increasing the land area.

One of the most interesting soil makers, wresting new territory from the ocean itself, is the Mangrove along the coast of Florida. Not only does it reach out with its aerial roots, entangling in their meshes whatever litter may float about, and thus gradually building up the shore, but it pitches even its young brood into the advance of battle, to wrestle with the waves and gain a foothold as best it may.

Not less interesting in this report is that denizen of the southern swamp, the Bald Cypress, with its curious root excrescenses known as Cypress Knees, which, whatever their physiological significance, are most helpful in expediting change of water into land sufficiently dry to be capable of supporting the more fastidious in regard to moisture conditions.

Here we should note the remarkable adaptation to divers conditions of some of the tree species. Trees of the swamp, or at least many of them, seem to indicate their independence of moisture conditions by the range of climate and soil in which they are found. In fact, they grow in the swamp, not because it is their most suitable locality, but because they are the ones that can do so, to the exclusion of other competitors. The Bald Cypress, in the Lake Drummond, itself, will grow in the dry soil and droughty atmosphere of Texas and Mexico; the Oaks, which associate with it in the swamp, will occupy almost any soil and site; the Red or Sweet Gum, or Liquidambar, which has lately become an important lumber producer, is found in similar ranges of habitat; the same Juniper or Red Cedar which in the swamps of Florida is a large tree and makes the soft material for our pencils, covers also the driest ridges of the Rockies and Interior Basin west of the Rocky Mountains, with a gnarly growth and hard texture, supplying the most lasting poles and posts. Thanks to the taste of the birds for its berries, it finds ready dissemination over a wide field of distribution from New Brunswick to Florida, and westward beyond the Rockies, forming with the equally frugal Aspen and Cottonwoods the very foremost advance guard of the forest.

This skirmish line of first comers, different ones in different climates, frugal in their needs, prepares the conditions for the more fastidious birches, elms, maples, ashes, oak, hickories, magnolias, spruces, firs, pines, and the whole host of the varied forest flora. Which of these will occupy certain territory depends in the first place on temperature conditions, and in the second

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place on moisture conditions of air and soil, and the various combinations of these factors, which determine the geographical distribution of species.

As far as temperature is concerned, there is no highest limit, provided sufficient moisture be present. The forest of the tropics gives evidence of this fact. On the other hand, low temperature extremes set a limit to tree growth, as the northern tundras and the well-known timber-line of high mountains show, varying in altitude according to latitude, i.e.,; temperature conditions.

As regards moisture, we have seen that many species live in the swamps of the south, with their feet in water for months, and their heads in a humid atmosphere all the year, while the plains and deserts, deficient in soil moisture and humidity of the air, are treeless, or at least forestless. Within these extremes, we find species adapted to every clime and site.

As we go from the tropics to the pole, there is a change in the type of the forest with each change of climate. From the evergreen, broad-leaved forest of the tropics and sub-tropics, we may journey northward through the deciduous-leaved forests of the Carolinas and Pennsylvania of oaks, hickories, chestnut and tulip tree, or, travelling along the Pacific Coast, through a mixed forest of firs, spruces, pines in most magnificent development. Then, continuing our journey on the Atlantic side, we reach the northern forest, in which maple, beech, and birch are predominant, with spruce and white pine intermixed. Beyond, the number of species decreases, and generally coniferous growth predominates; finally, only eight hardy species can take a stand against the frigid breath and icy hands of Boreas.

With decrease in the length of the season of vegetation in the interior of the continent, the forest growth becomes open and stunted. Finally we reach beyond the 62nd degree of latitude in the interior of Canada—in Alaska, much further north—the last outposts, short, tousled, and dwarfed, the Esquimaux of tree growth. Then the treeless tundra is reached, where ice and snow abound all the year, the home of winter. Here the soil is frozen for all but two months in the year, when only a low vegetation of willow and birch and of flowers can subsist. Just as we observe these changes in a long journey, we can trace them in a day's ride, if we were to ascend some mountain in the tropic or sub-tropic regions of Mexico or Jamaica. We begin our journey under the palms. Again we pass through the evergreen tropic forest, composed of an endless variety of species. As we ascend 2,000 or 3,000 feet the composition changes, and we have come into the deciduous-leaved forest, not unsimilar in general aspect to that of our middle latitudes. We reach a sandy plateau, and find it occupied with pines and saw palmetto as underbrush, just as we see it in the Carolinas. As we ascend to the 8,000-foot level, we enter into the dominion of spruce and firs, and we may find the open meadows with a profusion of flowers. These openings, in Colorado and other parts of the Rockies, are characteristically called parks. Here a depression has filled up with water, forming a lovely mountain lake, with the spruces and firs in spiral shapes surrounding the shores, just as you find them in British Columbia at lower levels. Another 2,000 to 5,000 feet, and the forest opens, as in our northward journey, the trees stand in groups and the grass and flowers occupy intervening spaces, competing for the ground. As we pass out of this lovely, park-like region, we come in sight of the peak and of the skirmish line of the forest, singly and in small groups the trees try to brave the blast, hugging the ground and each other for protection, tousled and dwarfed, as their northern counterparts. Finally we have passed timberline, where icy blasts and hard frosts occur every month in the year, and hence no persistent life can exist; and, if we are quick about descending, we may again rest under the palms at night.

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While, then, certain territory is assigned to the different tribes of tree species, which are adapted to the climatic and soil conditions, struggling to occupy the ground and wrest it from the lower vegetation, there is by no means an end to the evolutionary struggle, for, as soon as the ground is conquered, the battle begins between the conquerors themselves. Though not fought with claws and teeth, the struggle is as fierce, as persistent and as disastrous to the one or the other species as in the animal world, each trying to occupy the ground to the exclusion of the other. The weapons and the warfare are offensive and defensive, but relative endurance of one or more favorable conditions—adaptations to surroundings, insure mostly the final victory, and insure the survival of the fittest.

Prolific and frequent production of light-winged seed, carried by the wind to all open spaces, germinating readily and growing rapidly, gives an advantage to the one species. The heavy nut of the walnut or acorn must wait for squirrels, mice, birds, and water to extend its territory. The seed of the willow loses its power of germination within a few hours or days; hence it is confined mainly to the borders of streams, where favorable opportunities for sprouting exist. The acacia and others of the leguminous tribe, like the black locust, preserve their seed alive, for many years; nay, the seed of the former will often lie long buried in the ground, until a fire that destroys all other vegetation breaks their hard seed coats and calls to life the dormant germ; the cones of some pines remain closed, and release the seed only when fire, which has probably destroyed all competitors, opens them. The peculiarities of the seed, then, account for much in the distribution of plants.

Next comes the peculiarity of growth. The long-leaf pine, which, for the first four years, does not grow more than two or three inches above the ground, is at a disadvantage in that first period, during which it has occupied itself with forming a stout root system; but thereafter, by virtue of this root system, it may endure what a faster-growing neighbor could not. The quickly growing aspen covers large areas, but its reign is of short duration, for, as with most of the rapid growers, its life is short. The slower-growing spruce or pine, which could support itself under the light shade of the aspen, remains on the field, the victor by sheer persistency. While rapid, persistent height-growth enables these to escape the would-be suppressor, endurance of drouth or of excessive moisture of heat or cold, and of shade, favors others; windstorms and decay, in our primeval forests, acting as allies now to one, now to the other side, and thus changing the balance of power again and again.

In this struggle for supremacy between the different arborescent species, the competition is finally less for soil than for light, the most important factor of life, especially for tree growth. It is under the influence of light that foliage develops, and that leaves exercise their functions and feed the tree by assimilating the carbon of the air and transpiring the water from the soil; the more foliage and the more light at its disposal a tree has, the more vigorously it will grow and spread itself.

Now the spreading oak or beech of the open field finds close neighbors in the forest, and is narrowed in from all sides and forced to lengthen its shaft, to elevate its crown, to reach up for light, if it would escape being overshadowed, repressed and perhaps finally killed by more powerful densely-foliaged competitors. From the shape of the tree and of its crown we can judge whether it had to wrestle with neighbors (forest-maple, oak). The important fact, which predicates the issue, is that the various species are differently endowed as regards their ability to stand the shade or as to the amount of light which they need for their existence.

Go into the dense forest, and see what kinds of trees you will find there in the deep shade, and then go into an opening recently made, an abandoned

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field or other place where the full benefit of light is to be had by all alike, and you will find a different set altogether occupying the ground. In the first case, you will find, perhaps, beech and sugar maple or fir and spruce; in the second case you may find aspen, poplars, willows, soft maple, oaks, or pines, tamarac, etc.

All trees ultimately thrive best in full enjoyment of light and then only develop their characteristic form. (Elm, Bull-pine). But just as some species can adapt themselves to excess or deficiency in moisture conditions, so some can subsist and even thrive with less light than others, and we can classify and grade the species accordingly into tolerant or shade-enduring and intolerant or light-needing.

The dense spruce and fir forest shows by the number of trees that can occupy an acre the capacity of the species to thrive in the shade of neighbors, while the open pine forest gives an indication that the species requires larger amounts of light to thrive.

The densely-foliaged crown of the hemlock, with the branches beset with leaves into the very interior, attests its extreme shade-endurance, while the light-foliaged, open crowned larch or poplar, ash or birch, show their extreme sensitiveness to the absence of light by the very openness of their crowns, by losing their lower branches early and by the inability of their seedlings and young progeny to endure the shade of neighbors or even of their own parent trees.

To offset this drawback in their constitution, they have usually some advantage in the character of the seed, and are mostly endowed with a rapid height growth in their youth, so that, at least when the competition for light starts with even chances, they may secure their share by growing away from their would-be suppressors. They can keep themselves in a mixed forest only by keeping ahead and occupying the upper crown level, as the white pine does. The tolerant species, on the other hand, are able to thrive in the shade of light-foliaged species, usually increase more slowly in height; but their capacity of shade-endurance assures to them a place in the forest.

Many of them are characterized by a height growth, which, though slow, is persistent; while the light-needing species, by falling behind in their rate of height growth, often lose in the end what they attained in their youth. As a result the shade endurers finally become dominant, and the light needers occur in the mixed forest only sporadically, the remnants or single survivors of groups, all the outside members of which have perished; and only when a wind storm or insect pest creates an opening of sufficient size is a chance for their reproduction given.

Thus the composition and general appearance of the mixed forest is largely influenced by this difference in light requirements of the species present, and its numerical make-up, also depends upon the requirements by each individual and its capacity to get ahead of its neighbor.

Just as in the mixed forest the species are distributed according to their shade endurance, so in the pure forests of one species, or of species of equal tolerance, will the different-sized or different-aged trees develop side by side according to available light, each crowding the other, the laggards being finally killed by the withdrawal of light.

The victory comes to those, who by virtue of inherited superior vigor, or owing to the chance of finding better soil, domineer the community.

But, finally, even these must give way, for, as Hercules, the unconquerable, succumbed to the poison that penetrated to his bones, so does the mighty giant of the forest fall a prey to the insidious work of rot and fungus and insects and storms. When its heart is riddled and weakened, first the dry branches crumble and gradually give opportunity for the young after-

growth of shade-enduring kinds, waiting patiently for light, to strengthen; then break the large limbs and the dry top, and, having weathered the onslaught of the storms for centuries and the guerillas of the fungus tribe for decades, finally the giant falls with its decaying substance enriching the soil for future generations.

Into the breach rush the young epigones, each struggling to supplant their progenitor and to preserve the forest.

It is in consequence of these changes in light conditions that the alteranations of forest growth take place, oak following pine, or pine following oak; poplars, birches, cherries appearing on the sunny burns, and spruce, hickory, beech and maple creeping into the shade of these light-needing species and, in time, supplanting them.

While in the Eastern forest, under natural conditions, the rotation of power is accomplished in from 300 to 500 years, the old monarchs of the Pacific, towering above all competitors, have held sway 2,000 or more years. And, in this warfare, with changes in climatic and soil conditions going on at the same time, it may well occur that a whole race is crowded out and exhausted.

The virgin forest, then, is the product of long struggles, extending over centuries, nay thousands of years. Some of the mightiest representatives of old families, which, at one time of prehistoric date, were powerful, still survive, but are gradually succumbing to their fate in our era.

The largest of our eastern forest trees, reaching a height of 150 feet and diameters up to 12 feet, the most beautiful and one of the most useful—the Tulip tree (Lirodendron)—is a survivor of an early era, once widely distributed over the world, not confined to eastern North America, doomed to vanish soon from our woods owing to man's improper partisanship. Others, like the Torreyas and Cupressus, seem to have succumbed to a natural decadence, if we judge from their confined limits of distribution. The colossal Sequoias too, remnants of an age when things generally were of larger size than now, appear to be near the end of their reign; while the mighty Taxodium, the Bald Cypress, the Big Tree of the east, still seems vigorous and prosperous, wierd with the grey Tillandsia or Spanish moss, being able to live with wet feet without harm to its constitution.

So far we have considered the evolution of the forest only from the geographical and botanical point of view, and the history of its struggles for existence against the elements and against the lower vegetation and other forces of nature. A new chapter of its life history, a new relation, a new point of view began when man came upon the scene, and finally man has become the most influential factor in the evolution of the forest, changing it in composition and character of development.

The new point of view is that of usefulness, of economics, which arises from the need of man for wood, this most indispensable, most widely used of all materials, furnished by the trees of the forest.

Man recognizes that some species furnish a more valuable material for his purposes than others. These latter, which he will call weed trees, may in the struggle for existence, under the undisturbed sway of natural laws, have been better adapted to occupy the ground successfully against the more useful ones, and hence be in preponderance, or else they may have been kept in check by the useful ones, and these occupy the ground more exclusively.

By the manner in which man harvests the original crop, he predetermines what the succession shall be. If he remove all that he desires and destroys the rest by fire, the re-establishment must pass through nearly all the phases of evolution which the virgin woods had to pass. Where the denudation has been completed, the lower vegetation of weeds, brush must occupy

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the ground first and only after long struggle can tree growth re-establish itself.

If he clear the entire native growth, but leave a neighboring stand untouched, the species with tight winged seeds and capable of developing in full sunlight without the protecting shade of mother trees, will soon re-cover the bared ground.

If, as is customary, he culls from the mixed forest only those species which are useful to him, and leaves in possession the less desirable, the weeds, these necessarily provide for the succession of their own kind. If it be a shade-enduring species which he values, like the Spruce, its reproduction may still be possible, providing the openings are large enough, and enough seed trees are left to provide the new progeny, although necessarily the amount of the useful reproduction must be curtailed. If it is a light-needing species, like the White Pine, that he has culled, its reproduction is practically prevented in many cases by the mere presence of the unused portions of the stand. In the competition with other, especially shade-enduring trees, the light-needing species is placed at a disadvantage and disappears from the wood, unless man himself actively assists in its re-establishment.

Recognizing the laws exhibited by the evolution of the natural forest growth, the forester can direct the character of the new forest and make it serve his objects better than unaided nature can do.

By weeding first and systematically directing the reproduction of the better kinds before removing them, by natural regeneration as it is called, or else, where necessary, planting and protecting a crop of the desirable, the forester's forest is evolutionized from the wild woods.

The result is a crop, in which, as in a wheat field, the weeds are eradicated, and only the useful species cover the ground to the fullest capacity, producing from three to ten times the amount of useful material per acre that the wild woods are able to produce.

In the United States and Canada, this factor of evolution, man, is still working to the detriment of the future forest, having in view only the present needs.

Yet, with the establishment of Colleges of Forestry, and the assistance of such institutions as this, soon the new point of view, which takes into consideration the future, will be established, and, when the forester shall have built his home in the forest, a new phase in the evolution of forest growth will have been entered.

AGRICULTURAL EDUCATION IN THE HOME.

By Walter J. Brown, B.S.A., Principal Canadian Correspondence College, Toronto, Ont.

Education is not a new theme. Since the days of Plato, thinking men have recognized its importance. It is the process which fits a man to his life conditions. His knowledge, together with his ability to put it into practical use, determines his power; determines his value to himself and to the community of which he forms a part. Education, then, is an individual quality. To be educated means more than passing through the grades of a public school, the forms of a high school, and the years of a college or university. It means a balanced and disciplined mind, developed senses, and a facility in acquiring and utilizing knowledge. Our progress as individuals, our permanence as a society, and our hope as a nation and as an empire depend almost entirely upon the character and extent of our education. This is a vital ques-

tion. Few of us may have the time and opportunity to wrestle with the intricate problems of pure science, and fewer still, perhaps, have the inclination to dig out wisdom from the ruins of extinct civilizations; but all have time to learn the necessary things, for no man or woman in this age can afford to be ignorant of his or her life's work. There is no place to-day for unskilled workmen. The physician who neglects to master the requirements of his profession loses his practice. The lawyer who blunders in court and misinterprets the law fails to retain his clients. The merchant who does not watch the details of his business, and cater to the tastes of his customers becomes a bankrupt. The mechanic who turns out inferior work soon finds his patronage gone. What is true of the professional man, the business man, and the mechanic, is also true of the farmer, the stock-raiser, and dairyman. Every business to-day requires a combination of knowledge and skill. The farmer who wishes to secure the greatest profit from his labor must master the scientific principles underlying his practice, and must have the ability to so apply his knowledge that it will yield the largest return with the least expenditure of effort. In addition to this he must study carefully the many details of his business, and the requirements of the markets that his energies be not misdirected.

In the professions, in business, and in manufacturing, competition has compelled men to secure a higher standard of knowledge and greater technical skill, while the agriculturist, because of his isolation, has been slow to respond to similar demands. He has found it difficult to protect his interest by organization; and rather than study the needs of his market and make himself familiar with the character of the competition which he must meet from all quarters of the globe, he has done his work under less favorable conditions and has been forced to accept smaller profits. As in almost every country the agricultural interests are practically identical with the prosperity of the nation, the education of the rural classes has become a government function. In Canada and the United States, millions of dollars have been expended in the establishment and maintenance of experimental farms, agricultural colleges, dairy schools, farmers' institute systems, public lectureships, information bureaus, etc., all for the purpose of helping the farmer to solve his problems and increase the profit from his labor. In this country a large corps of scientific men are devoting their time and ability to his interests. At first this movement was met by a strenuous opposition and extreme prejudice from the very class whom it was intended to benefit. This peculiar trait of human nature is difficult to understand. The first railroad built in England was met by an armed mob. The first reaper brought into Canada, purchased by my grandfather, had to be guarded day and night by armed watchmen. To-day people clamor for railroads, and every improvement in agricultural machinery is received with delight. This Ontario Agricultural College had to pay its first students $50 a year to induce them to attend, but now there are more applicants than can be accommodated.

The demand for increased educational facilities has become almost universal. We are no longer willing that opportunities for systematic courses of study, for mental training and equipment shall be limited to the few. Only one person in one thousand can spare the time and money necessary to go to college, and only one-fifth of one per cent. of the eligible farmers' sons of this Province can be accommodated in this Institution. A plan has been devised to provide systematic instruction for the whole people. Teaching by correspondence has had fifteen years of successful history, and now places many of the advantages of a college education within the reach of every man, woman, boy or girl in the country. Students enroll irrespective of age, sex, location or previous training. If a person can read and write he

is prepared to begin. If he is willing to devote an hour or two each day, or even a quarter of an hour to his studies, a few months will suffice to help him master some useful subject. "Most men waste enough time for self-education." No one knows how much may be accomplished in his spare time until he tries. The student may continue his studies for years without interrupting his regular work. He learns each portion of his subject thoroughly, and in many instances applies this knowledge to his work immediately, thus increasing his earning powers. The expert teacher finds that he can guide and correct the student's work as effectively by the written as by the spoken word. In most cases the students take advantage of this opportunity because they are anxious to learn, and also because they are ambitious to enlarge their incomes; and as a result their progress is remarkable. Nearly every conceivable subject is taught by mail with success. Over half a million students in the United States and over twenty thousand in Canada are using this system. There is no excuse for anyone who is anxious for self-improvement to be without a first-class education.

The only Canadian institution making a specialty of teaching by mail is the Canadian Correspondence College of Toronto. It is essentially a national institution, founded and conducted by Canadians for the benefit of the Canadian people. Its faculty is composed of eminent specialists from British and Canadian colleges and universities. Its courses of study have been prepared with special reference to Canadian conditions, and at present include: preparation for the Canadian Civil Service examinations, Commercial Courses, the whole range of High School studies (including first year University work), Library Science for assistant and professional librarians; Household Science, embracing hygiene, household economics, cookery, home and emergency nursing, laundry work, floriculture, and household finance. The Industrial Department includes: Industrial Chemistry, Practical Prospecting, and special courses. Under Agricultural Science is taught general agriculture, farm crops, dairying, stock raising, poultry raising, veterinary science, horse raising, fruit farming, market gardening, and special courses in small fruit growing and vegetable gardening, cold storage, etc. In addition to these, special technical courses are conducted in harmony with the requirements of the Federated Insurance Institutes of Great Britain and Ireland for the employees and representatives of life, fire, and accident insurance companies.

The object of the Canadian Correspondence College is to offer educational opportunities to everyone within reach of a post office. Its motto is: "Make every home a college." Its aims are to increase the present standard of education by enabling public school teachers to acquire a higher grade of efficiency without giving up their positions; to offer to students planning to enter any of the colleges or universities an opportunity to secure a matriculation or first year university standing without leaving their homes, thereby saving their time and money; to increase the efficiency of employees in mercantile and manufacturing concerns; to stimulate farmers' sons and daughters to avail themselves of the advantages of a resident course in the Ontario Agricultural College; to supplement the work of the farmers' institutes, women's institutes, fruit growers and stock breeders' associations by providing systematic courses of study for their members; to assist the dairy schools to increase the value of the products of the dairy industry by helping cheese and butter makers and patrons of factories and creameries to master the principles of dairy science,—in short, to assist and work in harmony with all the educational institutions of the nation.

The greatest of sciences and the most important of industries is agriculture. To master all its details is beyond the power of any one mind. No

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other field offers such opportunities for research, and no calling yields to its follower a greater variety of interest and pleasure. The old Romans were enthusiastic agriculturists. Cicero, in one of his orations, gives the following splendid picture: "I come now to the pleasures of husbandry, in which I vastly delight. They are not interrupted by old age, and they seem to be pursuits in which a wise man's life should be spent. The earth does not rebel against authority. It never gives back but with usury what it receives. The gains of husbandry are not what exclusively commend it. I am charmed with the nature and productive virtues of the soil. Can these men be called unhappy who delight in the soil's cultivation? In my opinion there can be no happier life, not only because the tillage of the earth is salutary to all, but from the pleasure it yields. The whole establishment of a good and assiduous husbandman is stored with wealth; it abounds in pigs, in lambs, in poultry, in milk, in cheese, in honey. Nothing can be more profitable, nothing more beautiful than a well cultivated farm." The profit and pleasure in farming depends upon the education and skill of the agriculturist. The trouble with many farmers is that they are satisfied when they have mastered the elementary mechanical processes of their business, that is, how to plow a straight furrow, how to drive a team, how to operate simple machinery, etc. They have not made a careful study of the origin, composition, and physical characters of their soils. They do not understand the principles of tillage and drainage to enable them to prepare the best possible seed beds for their various crops, and control heat and moisture. Very few have made a study of fertilizers and manures, and consequently do not provide suitable plant food in right proportions for their growing crops, and many allow a vast amount of fertilizing material to go to waste. The farmer is dealing with the forces of nature under a great variety of climatic conditions, and cannot advisedly conduct his operations by rule-of-thumb methods. He should know the difference between injurious and beneficial insects, and how to curtail the ravages of those likely to destroy his crops. The subject of plant diseases and their treatment should be familiar to him. He should keep informed regarding the best varieties of grain, roots, forage plants, hay and silage crops, and know how to produce the greatest yields from his soils. Noxious weeds are too frequently allowed to flourish and injure his crops. As he does not understand the principles of breeding, selection and feeding, his stock is of second or third rate quality, and his labor and care in its behalf yields him meagre returns. The weak point with most farmers is their business management. They do not try to estimate the cost of producing a pound of pork, beef or mutton, a bushel of grain or a ton of hay. They do not know at what price they can sell their produce at a profit. They do not make a study of markets, and in many cases fail to sell their produce under the best conditions and in the most attractive form. No other business could be conducted upon such loose methods. The price of the farmers' produce is fixed largely by the law of supply and demand. His margin of profits will be determined by the cost of production; if he does not understand how to produce the largest crops and the best stock at a minimum outlay, and how to market them to the best advantage, he cannot hope to secure from his farm the income which it should yield. A great many men have been able to acquire much of the knowledge needed by experience and long years of patient toil; but this is an expensive process. The reading of agricultural papers, scientific bulletins, etc., is frequently suggestive, but is not intended to take the place of systematic and connected study. The farmers' institute meetings are held as near the homes of the people as possible, but no man can be expected to master the principles of the simplest busi-

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ness by listening to a few lectures one or two days in the year. How much does the average farmer carry away with him from such meetings? The addresses are practical and interesting, but they are not sufficient to give the modern farmer a scientific knowledge of his business. Farmers spend from fifty to one hundred dollars for a piece of machinery which they use for a few days in the year, but many of these are reluctant to devote a similar sum to improve the machinery of their brains, which they can use year in and year out, with increasing profit and pleasure. No other investment pays like a sound, liberal and proper education.

The question is not whether we farm as well as or better than our fathers farmed. Their conditions were very different from ours. The soils were rich, tillage, except for stumps, was easy, there were but few weeds, not many insects and seldom any plant diseases. Timber was plentiful and labor abundant. Nature was kind to the early settlers. They had enough to do hewing down the forests, building roads, digging stumps, harvesting their crops, and constructing the civil fabric upon which rests the safety, permanency and liberty of our people. But the modern farmer has a different task; he must not only compel a depleted soil to yield him large crops, but he must fight insects and plant diseases, weeds, and adverse seasons. One year is too wet, the next too dry. That is not all: the people who buy his produce are becoming more difficult to please. To get the best price the goods offered must be of fine quality, and put up in attractive packages. If he hopes to win and hold a place for his products in foreign markets, he must produce a better quality at less cost than his neighbor in Australia, Russia, Germany, South America, India, or the United States. This is not easy to do. The Australian wraps his apples in tissue paper, puts them into boxes, one hundred in a box, ships them to Europe, where they are sold for ten cents each. The Russian is a strong competitor of the Canadian in the British market. His horses are bought in large numbers, his cheese, butter, eggs, and poultry are increasing in popularity. The Australian and South American are endeavoring to control the meat market of Great Britain. Lines of steamships are busily employed carrying frozen beef and mutton from these southern countries to the British consumer. It is time we fully realized the situation. The Canadian farmer has everything to win and nothing to lose. His intelligence, properly directed, will eventually give him control of the market. The solution of this problem is, first and last, a question of education.

The courses offered by the Canadian Correspondence College are now within the reach of every farmer in Canada. He may educate his family at small expense. He may keep his sons on the farm by giving them an agricultural education, and his daughters in the home by inducing them to study household science. He may master the principles of any branch of agriculture for himself, thus helping him to meet competition successfully, and enlarge his returns. The subjects have been so prepared that the student obtains the information he requires without burdening his mind with scientific terms. The study papers are written in simple, clear, and concise English. With each study paper the student receives a test paper, which is intended to assist him in mastering the subject matter of his lesson. His answers are written out carefully and forwarded to the college, where they receive the attention of experts. When the student receives his corrected paper from the faculty, he finds the errors in spelling, punctuation, capitalization, subject matter, etc., indicated, and all necessary explanations appended. The student is assisted over every difficulty, and if in his study at any time he becomes discouraged, he is urged to write for assistance. This is

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practically private tutoring by mail. It is the modern method of education for those who cannot stop their work to go to college, or who cannot afford the cost of a resident college course.

Prosperity is upon us. In the great Northwest the farmer "Tickles the earth with the plow, and it laughs with a harvest." Millions of bushels of wheat are the product of one year's labor. In all other parts of Canada the farmer has been prosperous, and the whole people rejoice. Let us hold fast to prosperity by improving our methods of tillage, by reducing our practice to a business basis, by raising the standard for our products, by increasing the beauty, culture and refinement of our homes. Let us educate our families, and give our boys and girls a chance—to them the nation is looking for its leaders in society, in church, and in state.

Mr. George C. Creelman: I simply want to say that I endorse what Mr. Brown has said in connection with correspondence work in agriculture. I have gone so far as to allow Mr. Brown to connect my name with this institution. While under the Farmers' Institute system we hold eight hundred meetings among the farmers, it is a mere bagatelle in agricultural education. You cannot expect a man of ordinary intelligence to attend one meeting a year and carry away from it sufficient to last him during the year. The Department at Ottawa is doing good work in sending out literature in all lines of agriculture. We are endeavoring to supplement that work in the Department at Toronto. It is good work, and it is good literature, because we are constantly being asked for it. But these methods are too slow by themselves for the young men of the Province who have not the privilege of attending the O.A.C. or of having some consistent line of study at home. I believe that such a school with such a curriculum will be useful to the young men on Ontario farms who are not able to take regular courses at such an institution as this.

Prof. G. E. Day: I have noticed in my work as a teacher, both in the public schools and in the Agricultural College here, that the student who comes here and takes simply a special course without any particular direction—who does not take the full round of studies—seldom makes as good progress in his selected subjects as the student who takes the full course. I have observed this in a great many cases, and I think it is the rule. One of the reasons for this is that the young man who does not take all the work—who simply dips in here and there—gets a little out of touch and loses something of the enthusiasm which inspires a class as a whole, and, as a result, I do not think he takes the interest in his work; it is not so fresh to him. There is a great deal in all our studies in having someone, or some organization to direct them for us. A good deal has been said regarding the work of Farmers' Institutes, and of the reports and bulletins published from time to time and distributed by the Department of Agriculture, and they are excellent things; they have done a great deal of good. We have been making every effort to bring education to the farmer; to save him the time and expense necessary for a college course, and all the work done by Farmers' Institutes, Travelling Dairies and these publications distributed among the farmers, tends in that direction. But there is just this difficulty—there is no one to direct the young man (or the old man) in his reading of these subjects. If he runs across difficulties, there is no one to explain. If a man has regular work mapped out for him from day to day, he naturally will spend more time upon it and give it more earnest effort than if it is simply optional with him to look after it or not. Consequently, this work in the line of correspondence instruction is an effort to give systematic instruction, and we believe that kind of work will be more valuable.

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I should like to point out that the Correspondence College is not in opposition to, or in competition with, existing institutions. It is simply an effort to extend the work of these institutions and bring similar work within the reach of every person in his own home, who cannot spare the time to take a regular course in a college.

A very important question was touched upon, and that is the financial side. We are frequently asked, Does education pay? I do not think a direct answer can be given. I believe it does in every case, but probably in different ways, and it depends on the man. It may not pay some kinds of men, but there are others who would be greatly benefited. When we look upon the thing from a common-sense point of view, it seems difficult to realize how systematic education can help being a benefit to a man financially, besides adding to his standing in the community.

Prof. Jas. W. Robertson: I have listened to the paper with much interest and satisfaction. I was very glad to agree with all the speaker said regarding the true nature of education. Whether education pays or does not pay depends altogether on what a man counts worth most in life. I thought at once of the old remark, "What shall it profit a man?" People think that it pays to get money, to get property and to have a large bank account. Still a very sage teacher once asked. "What shall it profit a man if he gain the whole world and lose himself?" If a man is not educated he is lost. He is only a chip on the stream; he has not found his personality—his chance to serve other people. He is merely an atom of life that moves hither and thither. Therefore, with all thy getting, get education and understanding. A correspondence course can help very much, in my judgment. It first of all presents an arrangement of studies in the order of their difficulties. If a man tackles the most difficult part of a subject first, he will be like the little boy who tackled the bee at the business end. It is worth while to have the supervision which the teacher of known ability gives to such a course. I looked over the list of names, and there are names on it of teachers who are leaders of education in Ontario. If the supervision in anything be skilful and sympathetic, it helps the learner very much. You can get some of that from the correspondence course. The third thing that appeals to me in such a course is that if you are a man like myself who prefers the open-air and the executive work, and probably had some weeks a hundred letters of enquiry from people about the details of difficulties which they should be able to meet themselves if they were getting a proper course, you might conclude that here was a chance to load at least some of that correspondence on the Correspondence School. Another thing in which I think such a school may excel is that of giving the encouragement that comes to everybody—the consciousness that he is one of many trying to do a good thing well; to learn by doing and doing his best, even if his best is but a poor thing in the beginning. He may get the direction by listening as to how to do, but he learns by doing his best; not his half best; and he is encouraged to do that by having a great many others doing the same thing at the same time. Of course, you have one great advantage in an institution like the O. A. C.: you have here the up-lift of personal contact with leaders. The Correspondence School people lose this; I think this is the chief thing the student will miss if he is willing to work hard.

President Raynor: I think the remarks we have listened to will set us thinking. I am satisfied that it is a step in the right direction. It seems to me that the correspondence conducted by the weekly papers in answering questions on agriculture is a guarantee as to the success of an undertaking of this kind.

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THE IMPROVEMENT OF EDUCATION AT RURAL SCHOOLS.*

By Prof. Jas. W. Robertson, Ottawa.

The public schools of Canada have done a great deal to raise the general level of intelligence among our people. They have been a potent factor in our civilization; and I cannot say enough in their praise. While we see and appreciate the good they have done, that may qualify us all the more to see how much more good they could now do than they are at present doing, especially for the children of our population in the rural districts. There are certainly not less than seven hundred and fifty thousand boys and girls, between five and fourteen years of age, living in the rural parts of Canada; and thousands of the schools they attend give them very poor help to begin and continue life happily in our country. In these our years of progress and prosperity, cannot we afford enough out of our growing millions to give every boy and girl a chance in Canada to have a good elementary education! Is there anything worth while of what the nation needs to-day that compares with that?—that every boy and girl between the two seas should have a fair chance to get a good elementary education between the years of five and fourteen? Do we need their labor before they are fourteen years of age, except for their own good? Can we afford to require of any child in Canada to earn its living except for its own good until it is past fourteen? They are having to do it in lots of the rural districts of Canada where the school years are measured by threes or fours, and the school days by seventy in each of these years. The leaders in Canada have looked after the schools in the cities. Most of the leaders live in the cities and look after their own. The schools of the cities and towns are being adjusted now to the counting-house and the office, to the stores, the workshops, the factories, and to the professions; but where is the rural school which is being adjusted to the farm and the needs of the farm home? It is as it was, only a little more so in unfitness, because the towns, with their larger salaries and social attractions, draw the strong teachers from the rural districts to them. A teacher seldom teaches in the same rural school for more than one year; in the Protestant schools of Quebec they change to the extent of over sixty per cent. every year. Does that sort of thing give the boys and girls half a chance? They are the children of fathers and mothers who do not know enough themselves of the high value of education to seek any chance for their children. A man and woman who have a good education will spare no pains to get a good education for their children. If they have not an appreciation of it themselves, they say it does not matter much any way.

The first thing we need in Canada is to have the public go to school; to have public opinion—that factor in our life which must sanction and approve of every public movement if it is to be effective—to have that factor educated that it may demand and provide better schools for the boys and girls of the rural districts.

You do not educate a boy by scolding him or denouncing him. You can help to educate him by praising him, by appreciating him; by giving him a chance to observe; to recognize; to investigate; to understand; to do;—these are the means of education; opportunities for observation, for recognition, for investigation, for understanding, for doing. We are trying to educate the public by providing such means for them. We are hoping to give the public a chance to observe—to observe the better sort of school; to recognize its merits by investigation; to understand its use and

* NOTE. This is from the shorthand report of the address. The composition and style are different from what are desirable on a written contribution. It was intended to make impressions on listeners rather than to give expression in detail to the whole question of improvement.—J.W.R.

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bearings. They will all want that kind of school more and more as they go on with their own education. That is the use of the Macdonald Manual Training Fund and the Macdonald Rural Schools Fund, and the meaning of these two handsome buildings which are to beautify the campus of this fine College. The public are to have a chance to observe, investigate and understand, and then either go on with the New Education, improving it, or give it up, as they decide for themselves.

Education has a very large bearing on the occupations, wealth, and character of the people. All real education is a training of the faculties to fit men and women for life; and occupation, the earning of a living, is a large measure and part of life. Education has a great bearing on the wealth of the people. Nations, like individuals, are rich in themselves in proportion to their attainments and progress in education. I said here yesterday, in speaking on an educational topic for a moment, that people sometimes enquire, Does education pay? What does pay? What is wealth worth except as it enriches life itself. It counts for little if it only gives a man control of certain properties that lie about him. The only thing that is worth while is to enrich life itself; and education is the means of enriching life absolutely. A man may get his education in a school, or in a shop, or home, or anywhere else. I know a cabman in Ottawa who cannot read or write, but he is the best educated cabman in the whole city. He has the best horse and the cleanest cab, and the politest manner, and can always get twenty-five cents extra fare.

Education is not obtained from books, except in a small measure; it is a series of experiences. That brings me to speak, if I may for a moment, on the term education itself. One would hardly accomplish much if he were talking about schools and education with one meaning in his mind, while the people to whom he was speaking had another in their minds. I have known two men quarrel most furiously in an argument because one man was thinking of one situation, and the other of an entirely different situation. That is the way uneducated nations try to settle a difference of judgment. When we get sufficient education among the common people, nations also will adjust their differences by observation, investigation, and mutual understandings.

In the schools we used to be told that education meant "a leading out." Therefore, if you lead the mind out, the boy has education. Take an elastic band: the more often I "lead it out" the less use it becomes. There is no use in a leading out unless you lead the mind to do something when it is out. There is no use in leading a boy out to a perception of ideas unless he does something with the ideas in time to make perception part of the process of education toward ability. That is how education is gained and progress made —by putting every new idea to the proof—to the limit of its power to serve and nourish—by doing something with it. Education is a series of experiences. If a man gets the sort of education that means being led out for show at examinations, he may get more of the same sort in real life. A friend of mine, a very candid clergyman, had been led out to some congregation east of Toronto with a view to a call. Somehow he did not please them, and was returning home on the same train on which I travelled. He said to me, "I feel just as I suppose a horse may feel at a horse sale, when he has been led out and the horse dealer has said, 'That will do; just trot him back.' I am being trotted back." That is the judgment the great public will pass on every man's life who lets himself be led out for anything else than to do something with and by his ideas when they are out. That is the judgment the great Arbiter of all life will pass, "Who will render to every man according to his deeds," and not according to dreams and fine theories. If a man does nothing with his ideas except to recite them, he is not educated. So education is a

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series of experiences leading out to ability; ever increasing ability; ability to see, to understand, and then to do. Ability to see and ability to do—these two halves, seeing and doing, make education.

That you may fully enter into my way of seeing this, let us join in a little investigation. I learn with the utmost satisfaction that the processes of education at this College are along these lines—training to observe, to recognize, to investigate, to understand, and to do. This is worth any amount of fluent utterances from the lecture desk, which, however impressively spoken, may be forgotten in a week, and which are seldom remembered for more than a year. The student never forgets what he investigates for himself. Who is the uneducated person? Reflect and think of the people you know, and get a specimen of the uneducated; then put forward a specimen of an educated person. Observe them; investigate; find out what the differences are. If there are essential differences, then those are the marks that distinguish the uneducated from the educated. That is scientific procedure. Let us try to discover the marks of the uneducated. I may give you a hint where to look for a good specimen, a specimen we shall all agree upon as being entirely typical. We will take a baby a week old. I do not think it is any reflection on the young cherub's genius or intellect if we speak of it as comparatively uneducated. It has not had much chance for experience; if experience lies below all education, then it has not had much education. What are the marks? Total ignorance, utter helplessness and entire selfishness. I do not find any other marks that are always upon an uneducated person; but I find these always; and I take them as the marks—as the characteristics of the uneducated. Let us see, now, what education means: it means progress out of ignorance up into intelligence; progress out of helplessness up into personal ability, and progress out of selfishness up into unselfishness and public spirit. These are what distinguish between an uneducated and an educated person; the only essentials; nothing else counts; nothing else is worth while. One man may have uncouth speech; and if he be an Indian or a Highlander, he can talk as ancient a language as the man who can speak Greek; but if the latter has the marks of ignorance, and personal helplessness, and selfishness of behavior, he is an uneducated man.

The schools should teach boys to read and write and figure; of course they ought. The three "Rs" are a bit of the essential processes which a child will pick up as it goes on. But what of the three "H's"—hands, head and heart—his head out of ignorance, his hands out of helplessness into personal ability, and his heart out of selfishness into public spirit worthy of a citizen of the country.

The schools do a good deal to conserve and impart, and a little to train; but not much. I claim that the public schools should give a boy and girl the very best chance to make the most and best of themselves, and to get all that is needful for themselves amongst ourselves. If our schools are not doing that, let us improve them into schools that will serve us and our children towards happiness and ability.

But, you say, "The curriculum is over-burdened, and you want to put on Nature Study and Manual Training and Domestic Economy." No; I would begin by leaving out some of the formal book subjects. What use has a boy of eight or nine to know about his insides for the sake of keeping him from taking a glass of whisky or beer? It is a good deal better for the boy to leave those things alone; but it never fortifies him towards temperance to tell him about "his insides" at that age; it does not train his imagination except to morbid fears. When he grows up he will read all the advertisements of patent dicines; and worse than that, he will take some of them. I would begin by ving out.

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If you train a boy to observe, he will want to record. Then if you have the boy go to his plot in the school garden, pull up a plant and examine it carefully, if he does not know the name, he will want to find out. His reading lesson would have a new interest if it helped him in the difficulties he had met in his own investigations.

Did you ever walk seven miles to see a girl? You did not get tired if you wanted to go. If you rouse a boy into wanting to go after ability to read and write and figure, he does not get tired. Love of the task sets the pace for his progress. I will stipulate for thoroughness, and thoroughness by the present system is a travesty. When you have that, thoroughness, accuracy, self-reliance and diligence, all other things shall be added according to the ability of the teacher.

How are we to bring it about? Some of us thought an object lesson was the best thing to start with; and Sir William Macdonald invited my co-operation to carry out one of his desires. He found me rather unwilling to try for improvement of rural schools first. The man in the rural districts imitates the man who lives in town. The man who lives in town has the best chance of being a leader; and the man in the country would be willing to take a lower grade of education for his boy than a town or city man. I said, "You will get past the difficulty by trying to improve the city schools first." He said, "I will not help you in that, because already they are relatively so good that they bring the boys from the country to the city now." But it was important to get the leaders from the cities to recognize improvement by Training Fund and its work in twenty-one cities, towns and villages. Manual Training was the first step in this plan. The rural school was not an afterthought: it did not come out of the Manual Training movement. The Manual Training movement was a step towards the other end—that of improving the rural schools. Hitherto the wealth and wisdom of the country have been given to town schools. The little rural school has been left without help.

What is Manual Training? It is not technical education. I have been saying that for three years, even to Ministers of Education. Technical Education is teaching a trade or the principles of a trade. We do not teach a trade in the elementary school. We train the boy for the sake of ability in the boy. Manual Training is the training of the faculties—the hands and the body. It is not industrial education: that is teaching a trade. It is the general culture of the powers of the body and of the mind through the activities of the body, which is an essential part of education.

How is Manual Training brought about? By working at a bench: making simple things in clay or cardboard or wood. It is a training in accuracy, in ability to control self and environment, in expression of thought in deeds and in substances rather than in language.

Let me give you one or two illustrations of the process. We have here a wedge, for example. This is shown to the child: he is told to make a drawing of it, and then to reproduce it in wood. To do this he must think clearly, because the order of his action depends upon his thought. If he does not think clearly, he will cut the wood in the wrong place and have to begin again at the beginning. That is very different from accepting the marking of an error in blue pencil. He is taught to think clearly towards an end believed by him to be useful. That is a great gain. I used to think and reason on the problems of Euclid, but never knew what end I was striving for. Manual Training helps to carefulness, to accuracy, to a passion for the truth, and to self-reliance. You can never juggle with facts or substances here. You cannot commit a sophistry in wood. It would be a great gain to have boys with a reverence for the truth.

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What are the differences most noticeable in this New Education which Sir William Macdonald pays for? The teachers in both are the prime factors; then what? What are the most noticeable things in the old schools? Books and examinations? Is not that so? What was most highly esteemed—most requisite in the ordinary examination? A knowledge of facts and names and rules and forms! Many a student says: "If that does not help me in the examination, I have no time to waste on it." but such a man will find his error by and bye, when he is face to face with the obstacles of real life, which do not yield to anything but intelligence, ability, and unselfishness. Books are good things, blessed things: the store house of the great thoughts, of the great achievements, of the great intellects among men. I would not whisper a word disparaging of books. But when you get a good book, a book to your liking, what is your attitude, whether you are young, middle-aged or old? An attitude of passive receptiveness. That is particularly the effect of the book on the mind of the young. Here are the bench, the tools, and the materials. They stand for the active and constructive. A boy who puts in part of his school time at these gets more good out of books in his passive and receptive periods. The bench is not in conflict with the book, but is the complement of the book; and both help the boy better than either would alone. Examination papers are the detestation of teachers, and they are not welcomed by the pupils. If a young man when he leaves school knows hardly any standard except the verdict of his superiors, he is ill fitted to meet life's difficulties for himself. It is good to accept the judgment of our superiors, and it is better to have the boy competent to pass his own verdict and say, "That is the best I can do"; or, if it is not, "I will go and do it better." That is what the bench and tools and models demand and must have. They do not condemn the examination system, but make it effective. They help to turn out a strong boy willing to accept the decisions of his superiors; and knowing that he must pass verdict himself on himself and the quality of his work. Who cares if he cannot name all the varieties of spoons that were ever made to represent the maker's thought of the beautiful, if he can make one spoon true to his model—to his idea? It is no education in the knowledge of oats to learn the names of the varieties of oats. It is an education to grow one variety under close observation and management. The bench and the tools make a boy have regard for a knowledge of relationships of things that are real to him; not merely ideals and abstract principles, but real to the boy of ten and twelve. He is trained by things he knows are real. They are not any more real than others, but he knows they are. That is what counts in his education. These things make for character. The web and the woof of character are the deeds done in the body.

But the question is raised, What if it costs more money? Did you ever grudge paying for a thing you wanted very badly when you had the money? Is there anything you want more than to have your boy and girl make the most of themselves? If you have no boys of your own, you are better able to pay for other people's.

Observation, investigation, understanding, and recording: we want Nature Study like that, Manual Training like that, and Domestic Economy like that. These three, methods more than subjects, go together, and if half the time at school were given to the active and constructive in these, and half to the passive and receptive, from the teacher and from the books, the teacher and the books would have a new meaning. The boy would walk forward educationally on both legs instead of hopping on one.

How are we to bring about this improvement? What are the essentials of good rural schools? First, teachers who can teach like that. You say

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we have not got them. Perhaps not. In my judgment we have the material in the best of our teachers to make the best teachers for this sort of educational work. We have not to import men and women to do this teaching, but to give the Canadian teachers a chance to qualify, and they will be ready to carry on this instruction. We want good teachers, wholesome children, and efficient supervision; these are the three essentials. We also want good buildings and equipment, and beautiful surroundings, because a child educates himself easily by his environment. If the place is ugly and hardly decent, the child, maybe, gets a tarnish and taint. Then we want public support, both in interest and in money. These we need and want of the best,—teachers, children, supervision, buildings and equipment, beautiful grounds and public interest and support; we want a wholesome putting into practice of our judgment regarding these good things. If we cannot get them all at once, let us get as many as we can and as fast as we can. Take the little rural school house—the ugliest premises in the whole township; bare, treeless, flowerless, ill kept, weedy grounds,—these as environment when the children are young, plastic and susceptible. Why don't we make the school house, where the children spend most of their time, the brightest and best house in the locality?—the best. Why not spare, if we must spare, from other buildings? I have gone through townships where the barns were large and painted, and where the live stock were better housed than the children in school. Is that a good thing for us as Canadians—to believe that the immediate dollar from a cow or a steer or a horse is worth more than the ability and character and happiness of the boy and girl?

Efficient supervision. If it were not for the magnificent staff of public school inspectors we have, our schools would be much poorer than they are. These men are the counsellors, inspirers, and guides. These men have carried the load the people should have carried, and much that the Government should have lifted.

Why don't you have a school garden? we ask; and the reply is, "My boy is not going to be a gardener, but a lawyer or a physician." Why don't you have Manual Training? "My boy is not going to be a blacksmith." Why don't you have Domestic Economy? "My girls are not to be cooks and housemaids." Oh! the pitiful shallowness of judgment which prefers so-called gentility to thoroughness of culture for the duties and privileges of life, apart from the occupation by which a livelihood is earned!

Suppose you take an instance from near Guelph. Here we have five little schools in the country in the neighborhood of this College. Suppose instead of five little schools,—schools that I love for the sake of the children that go there and do not get the help they should get, schools from which go out boys who seven years from now will say how you and I shall be governed in Canada,—suppose instead of five schools we have one central school large enough to accommodate all these children. There is inspiration and stimulation in numbers. The one school would have rooms enough to have all the children of one age or stage of advancement go together in one class, so that they might be taught better. The school would have equipment and teaching staff and room on the time-table for Manual Training, for Nature Study with a School Garden, and for Household Science. Don't you think your boy and girl would go to a school like that if it were anywhere within reach?

Well, by the beneficence of Sir William Macdonald there is a fund in the Bank of Montreal to build and pay the extra cost of maintaining a school like that near this Agricultural College as an object lesson in improvement. The school garden will have plots to let the children see how the various grains grow—illustration plots of the useful and useless varieties in plants.

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The planting of shrubs, trees and flowers will make the grounds beautiful and full of interest. Every boy and girl above seven will have a plot as big as this table for his own possession during his school years. In it he will plant and cultivate. After he has planted a row of seeds, he will go back to school and have a writing lesson to record what he has done; a reading lesson to acquire knowledge he could not discover by himself; a drawing lesson, and a computing lesson. In this way the school will open up a new world of delight to the children, and train them to read and write and think better than in any other way. Let boys and girls go on with that sort of education for a few years, and you will find they have a trained imagination, and executive ability. The combination of these make the most valuable of all human powers. There you have it: training the imagination; correcting the expectations by an investigation of the facts; and going back and recording,—doing, doing, doing. That is Nature Study in the school garden.

How are you to get teachers to start these object lesson schools? By training some teachers now in the service. This training will be provided at the Macdonald Institute which is being built on the campus here. In the meantime a pioneer class of selected Canadian teachers are taking a short course of training at the University of Chicago. They will afterwards go to Cornell University, and then later on come here or go elsewhere for a further course in Nature Study. These teachers will take charge of the five object-lesson consolidated rural schools and the five groups of rural schools with school gardens under the Macdonald Rural Schools Fund. Later on 125 teachers a year will get short courses at the Macdonald Institute.

These consolidated rural schools will mean better roads, and free delivery of your letters in the country wherever the school van goes. The school will be the social and intellectual centre, every one will have a large assembly hall where the people can meet. This will lift the people out of isolation and bring them into fellowship. It will mean better education for the children, especially in regard to intelligence as applied to their lives in the country, and in public spirit for the promotion of the best interests of their locality and their homes; it will make them cherish ideas and ideals; by these individuals and nations live and rise; it will make them continue to love labor as every young child does; it will make them delight in making things that are beautiful and useful; it will lead them into such sympathy with nature and such symmetry of personal power that they will be continually "doing good"; it will make them lovers of truth, and the truth, as distinguished from and corrective of ignorance and superstition, shall make them free. Then we shall have a population that will realize Tennyson's noblest ideal of mankind:—"To live pure; to speak true; to right wrong; to follow the Christ, the King—else wherefore born?"

SHORT COURSES IN AGRICULTURE.

By Dr. James Mills, President Ontario Agricultural College.

I am glad that a large number of our students and ex-students and a good representation of visitors and have an opportunity of hearing Professor Roberts-n make such a clear and forcible statement of the facts regarding rural schools.

It takes time to get a good education; and I do not think our regular courses are any too long. We have a two-year course intended specially to fit young men for the life and work on the farms of this Province. This course we seek to make very practical.

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If a young man takes a high standing in the theory and practice of the first two years, he may proceed further,—he may remain two additional years and write for the B. S. A. degree, to be obtained from the University of Toronto. These we call our regular courses. The course for the B. S. A. degree is more scientific than the two years' course and aims, not only at farming, but also at preparing our graduates for such professional openings as may occur in connection with agricultural pursuits, such as, agricultural journalism and professorships in agriculture, agronomy, animal husbandry, entomology, biology, dairying, horticulture, etc., as well for Farmers' Institute work and the teaching of agriculture, horticulture, and nature study in our public and high schools.

There are a great many men, young and old, who would like to take all the time necessary to get a good education, and some, perhaps, who already have a good education on certain lines. For these we have recently provided three short courses; and we may possibly go further. At present, we have a two weeks' course in stock-judging, commencing on January the 8th. This is wholly devoted to the judging of horses, cattle, sheep, and swine, and seed grain. Those who attended last year found this a very profitable course. There is no charge for it, no entrance fee, and no examination at the end. Our own professors take charge of the work, and we bring in some of the leading stockmen of the Province to assist.

We have also a four weeks' course in poultry-raising, commencing January the 9th, carried on on similar lines.

Then we have a three months' course in dairying, milk-testing, butter-making, and cheese-making, which commences on January the 22nd.

We have been urged to confine our attention chiefly to these short courses, as they do in Wisconsin. That we are not prepared to do. So long as we have a large number of the young men of this Province willing to take a two years' course, as is the case at present, we are not prepared to give our whole attention to short courses. Short courses are all right in their place; but we can do much better for young men in the regular or longer courses. These short courses are merely supplementary in their nature, and for those who cannot spare the time for a two, three, or four years' course.

CLOSING REMARKS.

By Dr. James Mills, President, Ontario Agricultural College.

This is one of the few agricultural colleges on this continent which, for many years, made no provision for young women. Until recently we did not admit women to any of our courses, and as yet we do not admit them to anything but the course in dairying, and the short course in poultry-raising established last year. It began, however, to be felt that the homes are the most important factor in the happiness and prosperity of the community, and that we could not do what we ought for the homes of either town or country by educating the boys alone. We gradually came to think that there was as great reason and great need for educating the young women who are to take charge of the homes as for educating the young men who are to work on the farms, in the factories, or elsewhere. This was felt for some time before a move was made, because we are, perhaps, a slow moving people; but when we do move, we push ahead with a considerable degree of determination. Our people have now set their faces towards furnishing a more practical education for young women. As a people, we have done well in general education; and now we are seeking to give this education a more practical bearing, not

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only in the Agricultural College, but in the public schools and the high schools of the Province. Even the universities are beginning to realize that it is time to do something more than they have hitherto done towards fitting our young men and women for the struggle against the obstacles and difficulties that beset them in their efforts to make a living. So we may say that we are now endeavoring to give education a practical bearing. For three or four years, we have had in Hamilton a good School of Domestic Science, and within a year or two there have been established in Toronto several private schools with the same object in view. But this is not enough. Hence the Government has arranged to give elementary instruction in Domestic Science, and I believe in Manual Training also, in the three Normal Schools—Toronto, Ottawa, and London; and also at the Normal College in Hamilton. So, hereafter the teachers going out to work in our public and high schools will have some knowledge of these subjects.

But it was felt that still more was needed; and this has been provided through the munificent liberality of Sir William Macdonald, of Montreal, who has given $170,500 to the Province of Ontario, to provide in connection with the Ontario Agricultural College,—first, a large and well equipped building for giving teachers who have proved their ability to teach, and have had their preliminary training in one or other of the Normal Schools, the preparation necessary to enable them to take charge of schools such as Professor Robertson will describe; and second, a hall or residence which will provide a home for about 100 young women,—teachers and farmers' daughters. In this school, to be known as the Macdonald Institute, there will be a fixed course for teachers; and considerable liberty in the selection of subjects will be allowed to farmers' daughters.

PROPOSED MEMORIAL TO THE LATE PROF. PANTON

Moved by Walter James Brown, seconded by Allen Shantz, and carried unanimously, "That, in the opinion of the members of the Ontario Agricultural and Experimental Union, it is desirable that some form of memorial of the late Professor J. Hoyes Panton be secured and placed in one of the buildings of the Ontario Agricultural College; also that a committee be appointed to arrange details and report at the next regular meeting of the Union."

The following committee was named by the Chairman: Walter James Brown, Chas. A. Zavitz, Nelson Monteith, Elmer Lick, and E. C. Drury.

AN INCREASED GRANT ASKED FOR.

The following resolution was moved by Mr. Elmer Lick, Oshawa, Ontario, and seconded by Mr. Nelson Monteith, ex-M.P.P., Stratford, Ontario, and carried unanimously:

"We, the members of the Ontario Agricultural and Experimental Union, recognizing the demand for practical experiments along co-operative lines in different branches of agriculture, feel the need of an increased grant. We, therefore, apply to the Honorable, the Minister of Agriculture for Ontario, for an increase of $400 in the grant to the Experimental Union for 1903, in order to make the work even more thorough and extensive than in former years."

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THE UNION AND FORESTRY EXPERIMENTS.

The following resolution was moved by Mr. Nelson Monteith, ex-M.P.P., Stratford, Ontario, and seconded by Mr. Ernest C. Drury, Crown Hill, Ontario, and carried:

"The Experimental Union, recognizing the urgent necessity for action in the re-foresting of the waste lands throughout Old Ontario, would recommend that the Department of Crown Lands be requested to provide material sufficient to re-forest areas sufficiently large to provide forest conditions in typical situations throughout Ontario, the Union undertaking to supervise the distribution."

ADDRESSES ON HOUSEHOLD ECONOMICS.

For the report of the ladies' sessions, the reader is referred to the Annual Report of the Women's Institutes of Ontario, to be issued by the Department of Agriculture, Toronto, Ontario, during the year.

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THIRTY-FOURTH ANNUAL REPORT

OF THE

FRUIT GROWERS' ASSOCIATION

OF

ONTARIO

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
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1903.

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FRUIT GROWERS' ASSOCIATION OF ONTARIO.

OFFICERS FOR 1903.

President.....W. H. BUNTING, St. Catharines.
Vice-President.....ALEX. MCNEILL, Walkerville.
Secretary-Treasurer.....G. C. CREELMAN, Parliament Buildings, Toronto.

DIRECTORS.

Agricultural Division No. 1.....A. D. HARKNESS, Irena.
" 2.....R. B. WHYTE, Ottawa.
" 3.....HAROLD JONES, Maitland.
" 4.....W. H. DEMPSEY, Trenton.
" 5.....Wm. RICKARD, Newcastle.
" 6.....ELMER LICK, Oshawa.
" 7.....M. PETTIT, Winona.
" 8.....E. MORRIS, Fonthill.
" 9.....J. S. SCARFF, Woodstock.
" 10.....W. W. COX, COLLINGWOOD.
" 11.....T. H. RACE, Mitchell.
" 12.....J. H. HILBORN, Leamington.
" 13.....G. C. CASTON, Craighurst.

Ontario Agricultural College.....PROF. H. L. HUTT.
Honorary Directors:—THOS. BEALL, Lindsay; A. M. SMITH, St. Catharines; PROF. W. T. MACOUN, Horticulturist C.E.F., Ottawa.
Editor of Canadian Horticulturist.....L. WOOLVERTON, Grimsby.
Auditor.....J. M. DUFF, Guelph.

REPRESENTATIVES TO FAIR BOARDS.

London.....T. H. RACE, Mitchell; J. S. SCARFF, Woodstock.
Ottawa.....R. B. WHYTE, OTTAWA; HAROLD JONES, Maitland.
Toronto.....W. E. WELLINGTON, Toronto; G. C. CREELMAN, Toronto.

COMMITTEES.

Executive: PRESIDENT, VICE-PRESIDENT, and SECRETARY.

Board of Control, Fruit Experiment Stations: Chairman, DR. JAMES MILLS, MESSRS. W. M. OBR, A. H. PETTIT, A. M. SMITH and G. C. CREELMAN (*ex-officio*).

New Fruits: PROF. H. L. HUTT, PROF. W. T. MACOUN.

Canadian Horticulturist: G. C. CREELMAN, T. H. RACE.

Transportation: G. C. CASTON, Craighurst; H. W. DAWSON, Toronto; W. H. BUNTING, St. Catharines; D. D. WILSON, Seaforth.

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FRUIT GROWERS' ASSOCIATION OF ONTARIO.

ANNUAL MEETING.

The annual meeting was held in the Court House, Walkerton, on Monday afternoon, December 1, 1902. The chair was taken by the President, Mr. G. C. Caston, at 8 o'clock.

REPORT OF THE SECRETARY.

By G. C. Creelman, Toronto.

In presenting this, my first annual report as Secretary of the Ontario Fruit Growers' Association, I wish first to thank each and all of the officers and directors for their courtesy, kindness, and help during the year. Your Secretary must, at times, assume the responsibility of managing director, and frequently has to decide matters of importance to the Association without help from anyone. To the hearty "backing" of the Executive Committee and the approval of the Directors is due any advances that may have been made during the last twelve months.

Speaking generally, I feel that distinct advances have been made, and while the Ontario Fruit Growers' Association is the oldest society in affiliation with the Ontario Department of Agriculture, age here is no indication of lessened energy or halting progress.

1. Local Fruit Growers' Associations.

During the past spring many organizations were formed throughout the Province under the name of Local Fruit Growers' Associations. To these associations at the time of organization, or soon after, were sent experts who gave instruction in orchard management. Many of these associations were organized because it was found that the horticultural societies of the cities and towns, which were formed under the provisions of the Agriculture and Arts Act, did not apply thoroughly to practical fruit-growing conditions. The horticultural societies have devoted most of their energies to work in floriculture, and along the line of civic improvements. This dividing of the work will, no doubt, be a distinct advantage to both societies, in that each may be able to devote itself more particularly to its own line of work.

To this end the following letter was addressed to each director of the Ontario Fruit Growers' Association:

Toronto, February 12, 1902.

Dear Sir,—The question of District Fruit Growers' Associations was discussed at our last meeting, and I have since talked the matter over with the Minister and Deputy Minister of Agriculture. They have instructed me to proceed with the formation of such organizations. The proposal is to form a fruit growers' association in each district, such association, having secured fifty members, to become affiliated with the Ontario Fruit Growers' Association. It is proposed to make the membership fee of such association 25 cents, the same as that charged by the Farmers' Institutes, but any member wishing to become a member of the Ontario Fruit Growers' Association, and receive all the benefits of that organization, including the Canadian Horticulturist, may do so by paying an additional 75 cents.

The object of these local fruit growers' associations shall be, primarily, the giving of an opportunity for fruit men in each district to meet at stated intervals and discuss all matters pertaining to their business. I think it desirable that we send a good, practical fruit man to each district to co-operate with you and attend meetings which you have called in two, three or more places where you think you can count upon representative gatherings of men interested in fruit culture.

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You will be expected, in the interests of our association, to give your time freely to this work, but your expenses will be paid while you are engaged in it. I think I shall be able to secure from the Government a small grant to defray expenses of organization, and if you succeed in organizing a good district association, we shall have gone a long way toward bringing our fruit growers' association into closer touch with the man who grows fruit.

Such organizations, as are herein proposed, are not in any way to interfere with the horticultural societies now existing in our towns and cities. These societies have a function to perform which is quite different from that of fruit growing on the farm, and it is with the sole idea of helping the farmer to produce more and better fruit, that we are undertaking this new work.

Please let me know at your earliest convenience if you are in a position to undertake this work during the month of March, and also which points in your district would be best for meetings. If you cannot undertake this yourself, whom would you suggest among the progressive fruit men in your district to take hold of the work, call meetings, and discuss the fruit question.

When all of these letters had been replied to arrangements were made and the following circular issued, viz.:

At the last annnal meeting of the Ontario Fruit Growers' Association, the Secretary was requested to arrange a series of orchard institute meetings, particularly through the apple districts of the Province of Ontario. Since the beginning of the year the Secretary has been corresponding with fruit growers throughout the Province in reference to the best places to hold these meetings, and has finally arranged the following schedule. It is intended, as far as possible, to hold a short meeting in the hall in the afternoon at 1.30, and at 3.30 the meeting will adjourn to a neighboring orchard, where a practical demonstration will be given in pruning, grafting, etc., as well as a talk on orchard cultivation and methods generally pertaining to fruit growing.

It is expected that the members of the Farmers' Institutes and Horticultural Societies, as well as every farmer interested in the production of fruit, will be present and receive instruction and take part in the discussion.

In the evening, a general meeting will be held for the purpose of organizing a local Fruit Growers' Association. The object of these associations shall be to foster the fruit industry. Such organizations already formed have done good work in discussing methods of cultivation, and picking, packing, grading and handling of fruit, co-operative shipping, co-operative buying of packages, etc.

The following is a list of the meetings that were arranged, viz. :—

Delegates: H. Jones, Maitland ; G. W. Carson, Charleville.

Kemptville	March 24	Lyn	March 27
Roebuck	" 25	Mallorytown	" 28
Iroquois	" 26		

Delegates: Elmer Lick, Oshawa ; W. H. Dempsey, Trenton.

Wexford	March 21	Oshawa	March 25
Unionville	" 22	Bowmanville	" 26
Port Perry	" 24	Newcastle	" 27

Delegates: Elmer Lick, Oshawa ; G. C. Gaston, Craighurst.

Orono	March 31	Millbrook	April 2
Welcome	April 1	Grafton	" 3

Delegates: Mr. Vroom, Middleton, N.S. ; G. C. Caston, Craighurst ; Major H. J. Snelgrove, Cobourg.

Colborne	April 4	Brighton	April 5

Delegates: Mr. Vroom, Middleton, N.S. ; G. C. Caston, Craighurst ; W. H. Dempsey, Trenton.

Trenton	April 7	Wellington	April 10
Frankford	" 8	Picton	" 11
Consecon	" 9		

Delegates: G. C. Gaston, Craighurst ; A. E. Sherrington, Walkerton.

Port Elgin	March 21	Clinton	March 26
Walkerton	" 22	Hensall	" 27
Lucknow	" 24	Teeswater	" 28
Blyth	" 25		

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Delegates: Murray Pettit, Winona; A. McNeill, Walkerville.

Georgetown	March 21	Freelton	March 25
Bronte	" 22	Rockton	" 26
Waterdown	" 24	Ancaster	" 27

Delegate: W. N. Hutt, Southend.

Stayner	March 14	Creemore	March 15

Delegates: A. McNeill, Walkerville; W. W. Hilborn, Leamington.

Belle River	March 31	Chatham	April 7
Kingsville	April 1	Bothwell	" 8
Leamington	" 2	Ilderton	" 9
Wheatley	" 3	Lucan	" 10
Blenheim	" 4	Thedford	" 11

Delegates: W. H. Bunting, St. Catharines; G. E. Fisher, Freeman.

Grimsby	April 15	St. David's	April 17
St. Catharines	" 16		

These fifty-one meetings were held without a single failure, and the daily and weekly papers throughout the Province gave good reports of them. The *Weekly Sun* in particular devoted whole pages to the work, and the energetic Editor deserves the thanks of every man with an orchard, for his most excellent weekly reports.

As a result of these meetings 36 Local Associations were formed, viz.—

Association.	*No. Members.*	*Secretary*	*Address.*
Kemptville.	11	B. F. Dangerfield,	Kemptville.
Roebuck.	24	G. C. Carson,	Charleville.
Iroquois.	35	A. D. Harkness,	Irena.
Lyn.	15	Sheldon L. Brown,	Lyn.
Mallorytown.	9	H. M. Mallory,	Mallorytown.
Bowmanville.	35	James McLean,	Bowmanville.
Newcastle.	16	Mr. Davison,	Newcastle.
Orono.	12	John Rickaby,	Orono.
Welcome.	15	W. E. Inch,	Welcome.
Grafton.	17	Thos. Hoskin,	The Gully.
Colborne.	17	G. M. Peebles,	Colborne.
Brighton.	35	T. D. Sanford,	Brighton.
Trenton.	13	W. H. Dempsey,	Trenton.
Frankford.	12	A. F. Turley,	Frankford.
Consecon.	11	E. N. Wicks,	Consecon.
Wellington.	14	A. A. Morden,	Wellington.
Picton.	20	John Laird,	Picton.
Creemore.	10	F. E. Webster,	Creemore.
Stayner.	20	L. Patterson,	Stayner.
Clarksburg.	13	C. W. Hartman,	Clarksburg.
Meaford.	49	D. Havill,	Meaford.
Collingwood.	18	H. Wiggins.	Collingwood.
Ancaster.	31	James L. McNiven,	Ancaster.
Leamington.	8	W. W. Hilborn,	Leamington.
Port Elgin.	32	W. A. Mitchell,	Port Elgin.
Walkerton.	28	M. G. Dippel,	Walkerton.
Lucknow.	22	R. B. Cameron,	Lucknow.
Blyth.	28	Frank Metcalfe,	Blyth.
Clinton.	12	F. C. Elford,	Holmesville.
Hensall.	11	Alex. Buchanan.	Hensall.
Teeswater	32	Thos. A. Goodfellow,	Teeswater.
Georgetown	..	.....	.....
Bronte	..	.....	.....
Grimsby	..	.....	.....
St. Catharines	..	.....	.....
St. David's	..	.....	.....
	625		

As illustration of the nature of the work accomplished I append one report out of the many received.

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Georgian Bay Fruit Growers' Association.

A very profitable and interesting series of orchard meetings was held recently in this section.

Mr. W. N. Hutt gave a series of fine practical pruning demonstrations in the orchards at Meaford, Thornbury, Collingwood, Creemore, and Stayner. At each place he was greeted by a crowd of enthusiastic fruit growers, anxious to learn everything new in their business.

The pruning demonstrations proved to be just what they needed at that particular time, as there was a large number of young trees set out which need trimming, and also old orchards which need pruning badly. The farmers are waking up to the fact that a tree in order to be profitable must be well cared for.

The value of cover crops was thoroughly discussed, and considerable objection was taken to the time as generally given by speakers for the sowing of same. In the case of an orchard which was growing wood it might be all right, but, if an orchard was carrying a heavy load of apples, cultivation should be continued until the apples had made their full growth; otherwise, in a dry season there would be a great loss in size of apples from lack of moisture.

Another interesting discussion took place on the heading of trees, the general opinion being that they should be headed not less than 4 1-2 or 5 feet from the ground. The very general height of 3 1-2 feet was condemned by most, as the limbs come out just at a distance from the ground to be barked by the team or wheels of cultivator. A number were in favor of very low heading, about 10 or 12 inches, contending that the trees would be much easier pruned, sprayed and picked, and this latter would be especially true of plums, cherries and peaches, when if headed at that height much cheaper labor could be employed in picking. There would be no barking of limbs, as at that height a team would merely brush against the outside of the branches. That the cultivation around the trunk was of little value except for appearance, and with the extension implements being put on the market a tree could be cultivated as easily as when headed higher.

One must admit that considering the high winds in this section there is considerable force in the arguments for a lower headed tree.

At Meaford, where Mr. Hutt addressed the Horticultural Society in the evening, the weather was very unfavorable, as it rained nearly all afternoon; still, nothing daunted, Mr. Hutt went out and pruned trees between showers, and in spite of the rain about fifty farmers turned out.

The next meeting was at Collingwood, in the orchard of Mr. Wm. Marshall, where about sixty-five came out to see what they could learn. Among those present were G. F. Marsh, the Secretary; W. W. Cox, Vice-President; J A. Prentice, Local Secretary; John McKee, Secretary West Simcoe Farmers' Institute.

Here a very interesting object lesson was given on the methods of pruning the different varieties of fruit trees. In the evening a meeting was held in the court room, which was adjourned to attend a lecture given by the Deputy Minister of Education on "Our Educational System." After listening to a very instructive address, we met again in the court room, where Mr. Hutt gave a short talk on "Injurious Insects," which was much enjoyed. The Secretary, Mr. Marsh, explained the benefits to be derived from the formation of such an Association.

At Creemore we were favored by a beautiful day, warm and mild. The energetic local secretary, Mr. F. E. Webster, had arranged for the meeting at the orchard of Mr. W. Pattullo, the vice-president. Here we had some excel-

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lent object lessons, including all varieties of small fruits, grape vines, pear and plum trees. A well kept apple orchard which needed but little pruning, and one old tree which looked as if it had not been touched with a pruning saw for thirty years made an excellent subject. There were about one hundred at the afternoon meeting, but not so many for the evening. Mr. Hutt spoke on "Injurious Insects" again, and Mr. Marsh on the benefits to be derived from the Association.

At Stayner the next day, in spite of the cold wave, there were about fifty out in the afternoon. Among those present were, W. B. Sanders, President; L. Patterson, Local Secretary; F. E. Webster, Local Secretary of Creemore, and G. F. Marsh, District Secretary.

Here we had another very instructive demonstration, but little practical work could be done, as Mr. Bellwood had pruned his orchard as he does everything else he sets his hand to do—that is, thoroughly.

The closing meeting was held the next morning at Thornbury, when in spite of a snow storm and the cold, disagreeable weather, about thirty gathered in the orchard of Mr. L. Donaldson. Among those present were Mr. Mitchell, President and Superintendent of the Georgian Bay Experimental Fruit Farm; R. Ferguson, Local Secretary; T. McMurchy, Vice-President, and G. F. Marsh, Secretary.

This meeting closed this series of most pleasant and profitable orchard meetings.

RULES AND REGULATIONS SUGGESTED FOR LOCAL FRUIT GROWERS' ASSOCIATIONS.

1. The object of each local Association shall be the dissemination of information in reference to the fruit industry. The officers shall endeavor to bring the rank and file of the farmers who grow fruit into touch with the most successful local men, that the masses may become more conversant with the best and most profitable methods of planting, cultivating, growing, harvesting, and disposing of their garden and orchard products.

Organization of Fruit Growers' Associations.

2. A local Fruit Growers' Association may be formed in any locality in the Province of Ontario.

3. The organization meeting may be called by the District Director of the Ontario Fruit Growers' Association, by the Secretary of the Ontario Fruit Growers' Association, or by five fruit growers in the locality.

4. The annual membership fee shall be twenty-five cents.

5. As soon as the organization is complete the Secretary of the Ontario Fruit Growers' Association shall be notified, and the names and addresses of the officers shall be forwarded to him.

6. All memberships shall terminate the thirty-first of December of each year.

7. Each Association shall be known by a distinct name.

Officers.

8. The officers shall consist of a President, Vice-President, and a Secretary-Treasurer. The President and Vice-President shall be elected annually, and together with the Secretary-Treasurer shall constitute the Executive Committee.

9. There shall be elected annually two auditors to audit the accounts of the Association.

10. If the Secretary-Treasurer resigns, or for any reason does not perform the duties of his office, or if he removes from the district, the President shall assume the office and perform the duties of Secretary-Treasurer until such time as a new Secretary-Treasurer may be appointed.

Annual Meeting.

11. The annual meeting of each local Association shall be held during the month of January of each year.

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12. At the annual meeting the officers and auditors shall be elected for the ensuing year.

13. The newly elected officers shall take office at the close of the annual meeting.

14. At the annual meeting the election shall be by ballot. No person shall be eligible for office, or be entitled to vote, who has not paid his fees in full for the current membership year.

15. At the annual meeting the executive officers for the past year shall, through the Secretary-Treasurer, present to the meeting, in writing, a carefully prepared report of the proceedings of the year, in which shall be stated the number of meetings held since the last annual report, the attendance at each season, the total number of papers read and addresses delivered, and a statement of the financial condition of the Association. The financial statement shall first be audited and certified thereto by the auditors.

16. The annual meeting shall be advertised by mailing to each member at least ten days before the date thereof, an announcement calling the members together. Said announcement shall specify the date, place and hour of meeting, and shall contain a programme of said meeting. If the executive deem it in the interests of the Association, posters and newspapers advertising the meeting may also be employed to make it publicly known.

Order of Business.

1.—President's report.
2.—Discussion thereon.
3.—Report of Executive presented in writing by the Secretary-Treasurer.
4.—Auditors' report presented in writing.
5.—Election of directors; election of auditors.
6.—Suggestions as to how the Association may be improved or made more useful, if this has not already been considered by the President in his opening address and in the discussion following.
7.—Addresses by District Director of the Ontario Fruit Growers' Association, and others.

17. In case an Association shall, through any cause, fail to hold its annual meeting within the time specified, the Secretary of the Ontario Fruit Growers' Association may appoint a date for holding same, the meeting to be called as provided by the regular meeting, and this meeting shall in all particulars be taken as the annual meeting of the Association.

Monthly Meetings.

18. Meetings shall be held at least once a month for the purpose of carrying out the objects of the Association, as set forth in Clause 1.

19. At the first regular meeting following the annual meeting, the executive officers shall, through the Secretary, present an outline programme of the work to be undertaken by the Association during the year. As far as possible a specific topic should be selected and someone named at this time to discuss this subject.

20. No subject shall be presented at any meeting, or discussion allowed of a political or sectarian nature; nor shall any speaker be allowed in his lecture, essay or speech, or in any discussion, to advertise wares or schemes in which he has a direct or indirect pecuniary interest. The delegates and officers of the Association shall see that the exercises are not subordinated to any low or frivolous entertainments or to the aggrandizement of any individual, party or sect.

21. Should any local Association require the services of an outside speaker or demonstrator for any meeting or orchard gathering during the year, application shall be made for same to the Department of Agriculture, through the Secretary of the Ontario Fruit Growers' Association, Parliament Buildings, Toronto. The Department will pay the services of such a man for one meeting each year for each local Association, but the local Associations shall pay all legitimate expenses of such speaker or demonstrator from the time he leaves home until he returns thereto. When a speaker or demonstrator addresses meetings of more than one Association, the expenses will be equally divided between said Associations and collected from each.

22. No one should be named on a programme who has not agreed to do the specific thing he is advertised to do.

DUTIES OF OFFICERS.

President.

23. It shall be the duty of the President to preside at all meetings of the Association and of the Executive Committee. In the absence of the President, the Vice-President shall preside, and if both are absent a chairman shall be appointed by the Committee.

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Secretary-Treasurer.

24. The Secretary-Treasurer shall have the power of a managing director, acting under the control and with the approval of the executive.

Secretary.

25. It shall be the duty of the Secretary to call all meetings of the Executive Committee upon the authority of the President or any two officers, to give notice of all meetings as required by these rules, and keep correct minutes of the proceedings.

26. All official correspondence relating to the Association shall be conducted by the Secretary or in the name of the Secretary.

27. In all correspondence relating to the Association, the name of the Association shall be given in full after the signature of the officer, except in cases where an official heading is used giving the name of the Association.

28. All reports and returns required by the Department shall be made upon forms especially provided and in the manner indicated.

29. It shall be the duty of the Secretary to prepare and submit to the executive the annual report, as set forth in Clause 15, and to present the financial report to the annual meeting.

30. On or before the 10th day of February of each year, the Secretary shall send a revised list of members for the current membership year to the Secretary of the Ontario Fruit Growers' Association, and on or before the 10th day of each succeeding month he shall forward the name and address of each additional person who has since the previous return become a member of the Association.

31. On or before the 20th day of December, the Secretary shall report to the Secretary of the Ontario Fruit Growers' Association :

(1) The name of the place selected for holding the Annual Meeting, also the name of the hall in which it will be held.

(2) The decision of the Directors as to whether or not they wish the Secretary of the Ontario Fruit Growers' Association to arrange that a speaker address their Annual Meeting.

(3) The date chosen for holding the Annual Meeting.

32. The Secretary shall, when possible, retain the manuscript of all papers read at meetings of the Association by local talent, that he may, when required, furnish the Secretary of the Ontario Fruit Growers' Association with the same. Secretaries or essayists are not required to rewrite papers before sending them to the Secretary of the Ontario Fruit Growers' Association; forward them as read at local meetings.

Treasurer.

33. It shall be the duty of the Treasurer to receive and account for all moneys belonging to the Association, and disburse the same under the instructions of the executive, without whose order no money shall be paid out. He shall also prepare in detail and present to the Annual Meeting a duly audited statement of the receipts and expenditure.

34. The funds of the Association, as received by the Treasurer shall, when possible, be deposited in a chartered bank to the credit of the Association.

GENERAL RULES.

35. At all meetings of the Association ten members shall form a quorum. At an executive meeting two members shall form a quorum.

36. Each member of the Association whose name is sent in by the local Secretary to the Secretary of the Ontario Fruit Growers' Association shall be entitled to a copy of the Annual Report of the Ontario Fruit Growers' Association, the Annual Report of the Fruit Experiment Stations, and such bulletins relating to fruit culture as may from time to time be issued by the Department of Agriculture.

2. FRUIT INSTITUTES.

The work of our Farmers' Institute system, which formerly applied to dairymen, stockmen, fruit growers, and farmers as a whole, has been specialized into different departments, so that sections of the country engaged al-

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most entirely in one branch of agriculture may receive special attention, and the people residing therein the information which they require. For this reason in our fruit sections the Farmers' Institutes have become more or less fruit institutes, where speakers are supplied who are experts in the fruit business, and capable of giving the fruit growers practical and definite information. When it was decided to organize Local Fruit Growers' Associations we took advantage of the Farmers' Institute machinery, and solicited the co-operation of its officers. To the Institute secretaries we wrote:

TORONTO, March 13, 1902.

DEAR SIR,—I am pleased to announce to you that we have arranged to hold Fruit Institute meetings in your district this spring. The Ontario Fruit Growers' Association, at its last meeting, decided to co-operate with the Farmers' Institutes and, as far as possible hold meetings to assist the local fruit growers in their work. The meetings in your district will be held at and the speakers will be

I shall expect you to advertise the meetings, arrange for halls, and pay for the same out of the Farmers' Institute funds, as it will be largely your members who will receive the benefit at this time. The speakers will not cost your Institute anything. I will write a personal letter to each of the members in your district naming the place of meeting and the date, but I would like you to bill the district as far as possible, so as to ensure a good meeting. The idea is to call the meeting as usual at 1.30, and at 3.30 to adjourn to a local orchard for a practical demonstration in pruning, grafting, etc. In the evening a general meeting will be held for discussion and organization. You will please arrange with some one near the hall for the use of his orchard.

I would like you to look after this matter personally, but if you find you cannot do so, please appoint one of your directors, or a member who is particularly interested in fruit, to act for you.

The Institute officers responded with a will, and to their efforts are largely due the facility with which many of the Associations were organized. The Institutes also supplied the necessary funds for advertising, rent of halls, etc., and so made possible many gatherings which could not otherwise have been held.

In addition to securing the co-operation of the Institute officers, a personal letter was addressed to every member of the Farmers' Institute living within the township where a meeting was to be held. The letter read as follows:

LETTER TO INSTITUTE MEMBERS.

DEAR SIR,—At the last meeting of the Ontario Fruit Growers' Association I was instructed to arrange for a series of orchard meetings throughout the Province of Ontario. The object of these meetings is to bring the work of the Ontario Fruit Growers' Association into closer touch with the farmers who produce fruit, and also to bring together the fruit men in every district that they may talk over their work before spring opens. We have arranged to send you two good fruit men, who ought to be able to help you by suggesting improved methods of cultivation, pruning, and grafting, and the general care of the orchard. Your nearest meeting will be at and I trust you will find it convenient not only to be present yourself, but to bring others with you who are interested in this most important industry.

It is intended, where possible, to hold a short afternoon session, commencing at 1.30. At 3.30 the meeting will adjourn to a neighboring orchard for practical demonstration in pruning, grafting, etc. In the evening the speakers will take up the different phases of fruit culture and at the same time discuss the advisability of organizing a local fruit growers' association, the object of which shall be the meeting together of fruit growers to talk co-operative shipping, co-operative buying of packages, the best methods of picking, packing, grading and handling of fruits, etc.

I hope, therefore, that you will keep the date of this meeting in mind, and that you will appreciate our efforts by being present and taking part in the discussions.

This personal appeal met with such a hearty response that from first to last the Fruit Institutes were a splendid success.

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3. Pruning Demonstrations.

In the March series of meetings, wherever practicable, an adjournment was made to a neighboring orchard about 3.30 p. m. The delegate or delegates gave a short talk on the necessity for good pruning, and then proceeded to show how it should be done. In almost every case this method provoked a lively, practical discussion, which was especially appreciated by the farmers' boys. Fifty-one such meetings were held.

4. Thinning Fruit.

Still later in the season, when the fruit was pretty well advanced, requests came from orchard meetings, in the apple sections, for instruction in summer orchard management and the thinning of fruit. Here again the Dominion Fruit Inspectors helped us out, and the splendid work of Messrs. Lick and Carey is evidenced by the many complimentary letters from farmers who had received instruction. As it was not possible to cover all of the Province, nor yet any one section thoroughly, we picked out the County of Prince Edward and placed an orchard meeting within the reach of every farmer. Meetings were arranged for and advertised as follows, viz.:

Delegates:—Mr. Elmer Lick, Oshawa; Mr. P. J. Carey, Cobourg.

Albury	Stephen Dempsey's orchard,	July		22
Rossmore	W. Anderson's	"	"	22
Ameliasburg	Nelson Giles'	"	"	23
Bethel	Samuel Crawford's	"	"	24
Fish Lake	W. C. Gorsline's	"	"	24
Picton	John Laird's	"	"	25
Cressy	Geo. Hulbert's	"	"	26
Waupoos	Gilbert Walmsley's	"	"	26
West Lake	Isaiah Tubb's	"	"	28
Bloomfield	G. V. Christie's	"	"	28
Wellington	Walter Chadsey's	"	"	29
Consecon	Alb. McDonald's	"	"	29
Black River Bridge	E. Grimmon's	"	"	30
Port Wilfrid	Benj. Palmatier's	"	"	30
Cherry Valley	G. M. Knox's	"	"	31

5. Object Lessons in Spraying.

Following up the orchard meetings of March, at which pruning, grafting, budding and orchard management generally were discussed, we arranged for demonstrations in spraying, and the following letter was issued to the new secretaries of Local Fruit Growers' Associations:

Believing that you were pleased with the orchard demonstrations in pruning, we have made arrangements to follow up that work with a similar demonstration in spraying of orchard trees. Through the kindness of the Dominion Government we have been able to secure the services of some of the fruit inspectors, Mr. Elmer Lick, of Oshawa, and Mr. P. J. Carey, of Cobourg, among the number. One or both of these gentlemen have arranged to visit your Association on the date mentioned on the accompanying list, and are prepared to give a practical demonstration in spraying, together with a talk leading to a general discussion on orchard cultivation and management, and matters generally pertaining to the fruit business.

It will be necessary for you to supply a spray pump, some Paris-green, and materials for the Bordeaux Mixture, and select an orchard for the work.

Though the time is short and the farmers generally busy, still, this is the time when spraying ought to be done, and I would be glad if you would advertise the meeting as generally as possible. At the same time I would not have you put the meeting off because you thought there would not be a large crowd. Without any further intimation, therefore, I would be glad if you would make arrangements for this meeting. If you cannot do this yourself, please see that some one else takes hold of it in the right way.

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The following twenty meetings were then held in May, as advertised, with a good attendance at each meeting :

Whitby,	Coldsprings,	Picton,
Oshawa,	Grafton,	Belleville,
Bowmanville,	Wicklow,	Maitland,
Orono,	Brighton,	Iroquois,
Newcastle,	Smithfield,	Campbellford,
Welcome,	Trenton,	Warkworth.
Garden Hill,	Consecon,	

Spraying for the San Jose Scale.

The San Jose Scale Commission in their report to the Minister of Agriculture, in October last, recommended the use of the lime and sulphur application for winter treatment of the scale. The great difficulty, however, seemed to be the cooking of the sulphur. In talking the matter over with the Minister and the Inspector, it was decided to assist the orchardists in the matter by conducting practical demonstrations in cooking the sulphur and applying the mixture. St. Catharines, Niagara, Grimsby, Blenheim, and Kingsville were the points selected as being centres of scale infestation. At the first two places good meetings have already been held. Winona is advertised for this week, and the others will follow before the first of the year. These meetings are held under the auspices of the Ontario Fruit Growers' Association, and letters were sent to every fruit grower in the vicinity, as follows:

DEAR SIR,—The report of the San Jose Scale Commission, which has just been received by the Ontario Department of Agriculture, strongly recommends the lime and sulphur mixture for winter spraying. Its effectiveness has been proved by exhaustive experiments carried on last season. The only difficulty in its preparation is the boiling of the sulphur. This material requires two hours boiling in open kettles, and this being too slow a process where large orchards are involved, the Department has experimented with other means, and finds that steam from threshing engines may be economically used for the purpose.

Arrangements have been made whereby the process will be in operation at the farm of on when the wash will be both prepared and applied.

The Department is convinced that this remedy will be effective in controlling the Scale entirely, and hopes that the fruit growers who now see the destructiveness of this pest will make use of these washes for the coming winter, with the hope of stamping out the Scale entirely. Several of the other sprays, including crude oil, kerosene, etc., have been used with good results on other fruits than peaches, especially in the vicinity of Niagara, but the Department is sure the lime and sulphur wash will come into general favour on account of its extreme cheapness, viz., about two cents per tree. The Department feels that it has now reached a stage where the fruit growers must take an active part themselves in this war against the Scale, and hopes that all who can will attend the demonstration.

6. FRUIT EXPERIMENT STATIONS

In our orchard demonstration work we found we could make our work still more valuable to the people by having the annual meetings of the Farmers' Institutes take the form of a basket picnic on the grounds of the local Fruit Experiment Stations. In this way the different varieties under cultivation could be seen growing side by side, and it could be easily seen which were the best varieties to grow for market or home purposes. To make the work still more valuable we were assisted by some of the professors of the Ontario Agricultural College, who gave addresses and answered questions in reference to the growing of fruit, the destruction of insects, fungous diseases, etc. It is proposed to continue these meetings again next year. Scores of letters have arrived at our office since the meetings were held, all telling of the practical information received. Our Fruit Stations should be known to

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every farmer in their district. The experimentalist should be the district authority on what and when to plant, and what and when to graft, prune, and spray. If the Ontario Fruit Growers' Association by these and other means brings every fruit farmer in the Province in close touch with the work of the Fruit Experiment Stations it will do more for the industry than, in our opinion, can be accomplished in any other way.

7. Judging at Fall Fairs.

The past season has seen quite a revolution in the work of our Fall Fairs. Last spring a Superintendent of Fairs was appointed, and correspondence was at once carried on with the different Agricultural and Horticultural Societies in reference to Fair Improvement. The most marked result has been the arranging of Fairs in circuits and the request for expert judges for the different classes of exhibits. A number of the members of our Association were asked to judge the fruits, and most of our directors, had other engagements permitted, might have been kept busy judging fruit most of the fall.

I would suggest that this Board make out a list of persons who are known to be good judges of fruit, and also a list of those who could judge flowers, and place the same in the hands of the Superintendent of Fairs, that he might know whom to recommend to the different Fair Boards.

8. Model Prize Lists.

Last spring, at the request of the Canadian Association of Fairs and Exhibitions, a model prize list was prepared and sent to every Agricultural Fair Board in Ontario. This list was meant simply to be suggestive, and should be revised from time to time. Prof Hutt also prepared and recommended a prize list for flowers and vegetables. A number of the Fairs adopted the list as a whole; quite a number adopted it with modifications, and some replied that their Board knew best what was wanted in their own county. A number of the prize lists from these same counties, however, when examined, showed that prizes were still being offered for useless varieties, solely because they were grown in that neighborhood. The professional exhibitor also came in for some punishment this year. Fruit judges were instructed at several Fairs to cut open the exhibts, that the color of the flesh might be seen, that worms or decayed centres might be exposed, and that the fruit might be observed all the way through. Incidentally the fruit was destroyed, so far as further exhibiting was concerned.

I think this work should be pushed forward. Fair Boards should be further corresponded with, and our directors should, as far as possible, advise with different societies in their districts with a view to improving the fruit and flower prize lists of these Fairs. I am convinced, for I have examined every prize list in Ontario (and there are more than 400), that thousands of dollars are being thrown away annually in prizes for useless varieties. The fruit judges ought also to be prepared to give their reasons for the awards, and should be at the fruit exhibit at least one afternoon during the continuance of the Fair to give information on fruit matters to all enquirers.

Sixty Fairs were this year arranged in circuits, and judges supplied to place awards on all the classes of live stock, and I see no reason why the fruit exhibits could not be treated in the same way. An expression of approval from this Board, emphasizing the importance of the work, might help the new Superintendent to promote the work more rapidly.

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9. Apple Packing and Grading at Fall Fairs.

At a number of fairs this fall practical demonstrations were given in apple packing and grading. Here again the Association profited by the services of the Dominion Fruit Inspectors. Wherever they went they were surrounded by enquiring fruit growers. Questions were asked on all phases of the fruit business, and the demonstrations were watched and criticized by the eager onlookers.

10. Horticultural Societies.

Nearly two years ago the Ontario Fruit Growers' Association requested the Minister of Agriculture to provide funds for supplying lectures to the different Horticultural Societies in the Province. It was finally arranged with the Superintendent of Farmers' Institutes that this department take over that portion of the work, and in 1901 all of our affiliated societies were corresponded with, and such as desired it were provided with a lecturer. This year the same arrangement was made, and $434.80 was used out of the Farmers' Institute grant for lecturers' work in connection with our affiliated societies. In this connection I would suggest that the Minister be requested to add to our Fruit Growers' annual grant hereafter an amount sufficient to cover this expenditure.

The following correspondence will explain what steps were taken and what meetings were held :

Dear Sir,—At the last annual meeting of the Ontario Fruit Growers' Association, Mr. Woolverton, who had been acting in the dual capacity of Secretary and Editor of the *Canadian Horticulturist*, asked to be relieved of part of the work, and I was appointed Secretary-Treasurer of the Association.

It is my wish to assist the local Horticultural Societies in every way possible, and I write to ask if your society would like to have us send one or more speakers for a meeting in March

Last year the experiment was tried of adding, in some instances, a lady speaker to the delegation, and having both delegates speak on "Nature Study" to the school children in the afternoon. We found this to work admirably, and the advertisement given the Horticultural Society at the school almost invariably assured a good meeting at night.

As in former years, the only expense your society will be put to is the entertainment of the delegates while in your town. This Department will pay their railway expenses, as well as their wages.

In order to economize as much as possible, we are anxious to have the speakers have engagements each day, and we hope it will make no difference to you what day they are billed for your society. On hearing from you we will begin at once to arrange our programme for the March series.

Yours very truly,
(Signed) G. C. Creelman.

Meetings were then arranged for as follows :

Lecture Course for Horticultural Societies.

Lecturer : Prof. W. T. Macoun, Central Experimental Farm, Ottawa.
Subjects : "The Best Hardy Annuals and Perennials," "The Lawn and Garden," "Fruit Growing at the Central Experimental Farm," "The Fruit and Vegetable Garden."

Date.	Society.	Date.	Society.
March 10th.....	Cayuga.	March 13th.....	Grimsby.
March 11th.....	Niagara Falls.	March 14th.....	Hamilton.
March 12th.....	St. Catharines.		

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Lecturer: W. N. Hutt, Southend.

Subjects: "Birds in Relation to Horticulture," "Insect Friends and Foes," "Pruning of Trees and Plants," "Beautifying the Home," "Spraying Mixtures and Their Application."

Date.	Society.	Date.	Society.
March 3rd	Perth.	March 11th	Owen Sound.
March 4th	Smith's Falls.	March 12th	Meaford.
March 5th	Kemptville.	March 13th	Thornbury.
March 10th	Orillia.		

Lecturers: A. Gilchrist, Toronto Junction; Mrs. E. M. Torrance, Chateauguay Basin, Que.

Subjects: A. Gilchrist, "How to Plan the Home Grounds on Natural Lines," "Village Improvement," "Improvement of School Grounds with Native Plants Along Educational Lines," "The Best Trees and Shrubs for a Suburban Lawn," "The Care of House Plants."

Mrs. Torrance, "Every-day Plants for our Gardens and Homes."

Date.	Society.	Date.	Society.
March 3rd	Port Hope.	March 10th	Paris.
March 4th	Napanee.	March 11th	Woodstock.
March 5th	Stirling.	March 12th	Chatham.
March 6th	Lindsay.	March 13th	Norwich.
March 7th	Brampton.	March 14th	London.

Lecturers: E. B. Stevenson, Jordan Station; Mrs. Torrance.

Subjects: E. B. Stevenson, "The Strawberry: The Promising New Varieties," "Verandah Decoration," "Winter Window Gardening," "Bulb Growing for Young Amateurs."

Mrs. Torrance, "Every-day Plants for Out Gardens and Homes."

Date.	Society.	Date.	Society.
March 17th	Mitchell.	March 20th	Kincardine.
March 18th	Seaforth.	March 21st	Mount Forest.
March 19th	Clinton.		

Mrs. Torrance also attended a meeting at Toronto Junction on February 28th.

Lecturers: Dr. C. J. S. Bethune, London; Mrs. A. Gilchrist, Toronto Junction.

Subjects: Dr. Bethune, "A Talk About Insects: Noxious and Beneficial," "Common Garden Insects Affecting Flowers, Fruit and Vegetables," "Domestic Insects Affecting Flowers and Property."

Mrs Gilchrist, "Nature Study," "How I Grow My House Plants," "Our Native Plants for the Home Grounds."

Date.	Society.	Date.	Society.
March 4th	Elmira.	March 10th	Port Dover.
March 5th	Waterloo.	March 11th	Simcoe.
March 6th	Guelph.	March 12th	Hagersville.
March 7th	Hespeler.		

Dr. Fletcher also addressed the Society at Cardinal later in the season.

When arrangements were completed the following letter was sent to the Secretary of the Horticultural Societies:

DEAR SIR.—Enclosed you will find a list of meetings to be held in your district under the auspices of the Horticultural Society. We have selected speakers this year from a long list of applicants, and hope that your members will not fail to ask questions and get as much information as possible from the lecturer.

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Last year the lecturers visited the schools in the afternoon, and addressed the school children upon some topic connected with horticulture. This seems to have been appreciated, for we have had many applications for similar instructions. We hope you will make arrangements to have this feature of the work repeated, for, besides the interest which the scholars may take in it, it will be a good advertisement for the evening meeting.

Wishing you a successful meeting and a prosperous year in the work of your Society.

Relation of Horticultural Societies to Fall Fairs.

I believe that the Horticultural Societies could profit by the assembling of people at the Fall Fairs to advertise their work, and at the same time impart much instruction. Instead of giving money to Agricultural Societies to be used in the prize list, the local society should first suggest to the Fair Board the propriety of revising the list each year. The society should then select those varieties of fruit and flowers that they wish to encourage, and specify that the society funds must be used for those classes or sections only. The Societies might also have one of their members present near the flower and fruit exhibit who could give the visitors information as to how to plant, cultivate and grow the flowers displayed. The Societies might also advise the Fair Board regarding the selection of judges for fruit and flowers.

The School Children.

If we wish to have the men and women in this country interested in fruit and flower culture, we must first attract their attention while yet children.

School Children at the Fairs. In the fall of 1901, Mr. Barlow Cumberland, of Toronto, offered a special prize to the old County Fair at Port Hope. This prize was to be awarded to the boy who could properly name the greatest number of varieties of apples in a miscellaneous assortment. Quite a number of contestants entered, and in 1902 several other shows took up the work. Such work as this should stimulate the young people to a greater interest in farm work.

A number of Fairs this year also offered special prizes for the children of a school section who would work together and make an aggregate exhibit.

The following are the classes for which prizes were offered and the rules governing the same:

Exhibits by School Children.

Rules Governing Class A.

1. All plants, flowers, leaves, fruits, roots, vegetables, weeds, and weed seeds, mentioned in sections 2 to 6 of Class A, must have been grown and gathered in the school section making the exhibit, and in the case of section 7 caught within the Province.

2. Each plant shown in sections 2 and 3 shall be separately tied to admit of individual inspection. The plants of each variety shall be neatly bound together and labelled. In section 1, each variety shall be bound and labelled.

3. All the work in connection with each of the exhibits in Class A, must have been done by the pupils under the direction of the teacher, and with his or her assistance or supervision.

4. The prize money awarded to a school shall be paid to the teacher, who shall retain 25 per cent., the remaining amount to be equally divided among the children who have taken part in making or preparing the exhibit.

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Class A.

1. To the teacher and pupils of a public school section making the best and best arranged exhibit of cut flowers grown in the school grounds.

Prize:—1st. 2nd. 3rd. 4th.

2. To the teacher and pupils of a public school section making the best and best arranged exhibit of grain in the straw the growth of the current year, showing stools, branches and part of roots, consisting of six complete plants of each variety, with not more than three varieties of each kind of grain.

Prize:—1st. 2nd. 3rd. 4th.

3. To the teacher and pupils of a public school section making the best and best arranged exhibit of clovers and grasses, the growth of the current year, showing all branches and part of root of each plant. This exhibit to consist of at least six plants of each variety shown. At least six varieties must be shown in each exhibit in this section.

Prize:—1st. 2nd. 3rd. 4th.

4. To the teacher and pupils of a public school section making the best and best arranged exhibit of roots, fruits, and vegetables.

Prize:—1st. 2nd. 3rd. 4th.

5. To the teacher and pupils of a public school section making the best and best arranged exhibit of wild flowers and leaves of trees, pressed and mounted, each specimen to be properly labelled.

Prize:—1st. 2nd. 3rd. 4th.

6. To the teacher and pupils of a public school section making the best and best arranged collection of weeds, cured and mounted, and weed seeds, in ounce bottles, each specimen and bottle to be properly labelled.

Prize:—1st. 2nd. 3rd. 4th.

7. To the teacher and pupils of a public school section making the best and best arranged collection of beneficial and injurious insects, mounted and properly labelled and arranged in groups according to their habit or the fruit, grains, etc., which they attack.

Prize:—1st. 2nd. 3rd. 4th.

Our sympathies should be with this work.

THE CANADIAN HORTICULTURIST AND OTHER LITERATURE.

The Horticulturist during the year has very much improved. Your committee, appointed at the last annual meeting to assist the editor in his work, met each month in the Secretary's office. All matter for publication was read to the committee and commented upon. The Executive Committee believe that it would be in the interests of the Association to continue the work of that committee.

The Department of Agriculture has also issued two publications during the year of interest to the members of our Association. The first is a hand book of Women's Institutes. This contains illustrated articles on floriculture which are practical and up to date. The second is just out and is in line with a resolution passed by the Association last year. It is entitled "Nature Study," and will, I think, be very helpful, in disseminating truths in reference to elementary science.

SUGGESTIONS.

1. I would respectfully suggest that a committee be appointed to revise the Constitution.

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2. That a resolution be passed requesting the Minister of Agriculture to permit the Association to fix its own boundaries for representation of directors.

3. That the clause in your Constitution in reference to Auditors be amended by striking out the words, "and two auditors," and that a new clause be added to read as follows: The accounts of the Association shall be audited by an expert auditor or accountant appointed by the Executive and approved of by the Minister of Agriculture.

G. C. CREELMAN,
Secretary.

Mr. Murray Pettit: This report should not be passed over without some expression from the Association. I think it would be well to refer it to a committee to report upon, as there are so many valuable suggestions contained in it. I am sure the Secretary is well deserving of the thanks of the Association for the energy he has displayed, and I have much pleasure in moving the adoption of the report.

Mr. Race: The report is so suggestive that we might well spend all the time allotted to us in discussing it. I do not think it necessary, however, to refer it to a sub-committee. I do not see that any committee could make the suggestions any clearer than they are, or that the recommendation of such a committee is necessary.

Mr. W. H. Dempsey agreed with Mr. Race.

The motion for the adoption of the report was seconded by Mr. A. M. Smith, and carried.

FINANCIAL STATEMENT.

Receipts.		Expenditure.	
Cash on hand	$ 375 03	Canadian Horticulturist	$2,296 93
Members' fees	4,447 67	Salaries, editor and secretary	1,216 66
Legislative grant	1,800 00	Commissions	719 14
Advertisements	283 65	Premiums	436 77
Samples	8 32	Illustrations	435 60
Binding volumes	5 30	Annual meeting	453 57
		Bookkeeper	202 00
		Reporting	225 80
		Postage and telephone	151 69
		Printing and stationery	151 63
		Affiliated societies	119 30
		Committees and delegations	143 09
		Express and freight	31 58
		Auditing	21 50
		Collection and interest	4 65
		Bookbinding	11 50
		Rent	24 00
		Miscellaneous	12 40
		Typewriter	16 00
		Fruit Institutes	4 60
		Total	$6,678 41
		Balance on hand	241 56
Total	$6,919 97		$6,919 97

G. C. Creelman, Treasurer.

Audited and found correct.
A. H. Pettit,
W. M. Orr, Auditors.

Mr. Race: I see $476 for premiums. Are they worth that amount to the Association? Could we not keep up the Association as well without them?

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Suppose we allowed the affiliated associations to retain a little more of their money and provide their own premiums?

Mr. Woolverton: I assure you they increase the work of the Secretary very much.

Mr. Snelgrove: Would you reduce the price of the magazine in that way?

Mr. Race: I scarcely see how we could do that, and do not think it would result in any more subscriptions.

Mr. Creelman: Could you not improve the magazine?

Mr. Race: Certainly; and I think the Board will admit that it has been improved during the past year. Mr. Race then suggested that it should be made optional with the local associations as to whether they would take the premiums sent out by the Associations or supply their own and remit a smaller amount per head to the central Association.

Mr. Creelman did not think it would be well to cut off the premiums altogether, as they had already been promised in many instances.

Mr. McNeill said that the premiums were highly thought of by most societies, and that there was no better method of securing subscriptions to the Horticulturist. He endorsed Mr. Race's suggestion to make it optional, but thought that a majority of the societies would prefer the premiums to a reduction in the rate.

Mr. E. Morris did not think that small fruit plants should be sent out. These could be obtained from the nurseries. He thought that newer varieties of shrubs and herbaceous plants for ornamental purposes should take their place.

Mr. R. B. Whyte said that last year the varieties sent to his section were worthless for that part of the country, and suggested that there should be a better selection.

The Secretary said it would not do to have too many options, as it made the matter too expensive to handle. He thought it would be well to decide on two or three varieties which would be likely to give general satisfaction, and which the Association would like to see introduced in every home plot in the Province.

The President said that the distribution of small fruits was begun as a sort of experimental work, but that this had given way to the Experimental Stations.

Mr. Morris thought that the committee should make provision not only for this year, but for succeeding years, so as to give nurserymen a chance to supply the number of plants that would be required, otherwise they might be difficult to procure.

On the motion of Mr. Whyte, seconded by Mr. Dempsey, it was decided to appoint Messrs. Hutt and Macoun a committee to prepare a list of shrubs and herbaceous plants from which premiums might be selected.

It was moved by Mr. Jones, seconded by Mr. Scarff, that the Treasurer's report be adopted. Carried.

The minutes of the last annual meeting were read and adopted, after which the Secretary read communications from the towns of Collingwood and Leamington inviting the Association to hold its next annual meeting at those points.

On motion of Mr. McNeil, seconded by Mr. Race, it was resolved that the invitation of the town of Leamington be accepted.

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LIST OF PLANTS RECOMMENDED FOR HOME AND SCHOOL GROUNDS IN ONTARIO.

By Arch. Gilchrist, Toronto Junction.

Native Herbaceous Plants that will Transplant Well.

Columbine	Aquilegia Canadensis.
Liver-leaf	Hepatica tribola and acutiloba.
Bloodroot	Sanguinaria Canadensis.
Cardinal flower	Lobelia cardinalis and syphilitica.
Harebell	Campanula rotundifolia.
The Lily Family	Lilium Canadense, Philadelphicum, and superbum (Turk's-cap lily).
Phlox	Phlox divaricata.
Wake-Robin	Trillium grandiflorum and erectum.
Solomon's Seal	Polygonatum biflorum and giganteum.
Dog-tooth Violet	Erythronium Americanum.
Spurge	Euphorbia corollata.
Butterfly-Weed	Asclepias incarnata and tuberosa.
Wind Flower	Anemone nemorosa, Virginiana and Pennsylvanica.
Meadow-Rue	Thalictrum dioicum and Cornuti.
Sneeze-Weed	Helenium autumnale.
Cone Flower, purple and yellow	Rudbeckia laciniata and hirta.
Sun-Flower	Helianthus divaricatus.
Beard-Tongue	Pentstemon
Mayflower-Ground Laurel	Epigaea repens.
Squirrel Corn	Dicentra Canadensis.
Dutchman's Breeches	Dicentra cucullaria.
Violets	Viola cucullata, pubescens and Canadensis.
Lupine	Lupinus perennis.
Geranium Cranesbill	Geranium maculatum, Robertianum (Herb Robert).
Wood Sorrel	Oxalis acetosella and stricta.
Saxifrage	Saxifraga Virginiensis.
Blazing Star	Liastris spicata and cylindrica.
White Snake-root	Eupatorium ageratoides.
Elecampane	Inula Helenium.
Golden Rod	Solidago Canadensis.
Starwort	Aster multiflorus and Novae-Angliae.
Oswego Tea, Horse Mint	Monarda didyma.
Wood Betony	Pedicularis Canadensis.
Waterleaf	Hydrophyllum Canadensis.
Dogbane	Apocynum androsaemifolium.
Skunk Cabbage	Symplocarpus foetidus.
Bellwort	Uvularia grandifolia.

Native Shrubs.

Sweet Fern	Comptonia asplenifolia.
Dwarf Shadbush	Amalanchier botryapium.
Chokeberry	Pyrus arbutifolia.
Maple-leaved Viburnum	Viburnum acerfolia.

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Native Apple	Pyrus coronaria.
Common Elder	Sambucus Canadensis.
Red Osier	Cornus stolonifera.
Round-leaved Dogwood	Cornus circinata.
Witch-Hazel	Hamamelis Virginica.
Ceanothus New Jersey Tea	Ceanothus Americanus.
American Holly	Ilix opaea.
Cockspur Thorn	Crataegus crusgalli.
Sassafras	Sassafras officinale.
Common Meadow Sweet	Spiraea salicifolia.
Mountain Maple	Acer spicatum.
Silky Cornel	Cornus sericea.
Purple-flowered Raspberry	Rubus oderatus.
Scarlet-fruited Thorn	Crataegus coccinea.
Leatherwood	Dirca palustris.
Red-berried Elder	Sambucus pubens.
Shadbush Juneberry	Amalanchier Canadensis.
Shepherdia	Shepherdia Canadensis.
Snowball Guilder Rose	Viburnum opulus.
Alternate-leaved Dogwood	Cornus alternifolia.
Snowberry	Symphoricarpus racemosus.

Native Creepers.

Virginia Creeper	Ampelopsis quinquefolia.
Bittersweet	Celastras scandens.
Honeysuckle	Lonicera ciliata.
Virgin's-Bower	Clematis Virginiana.
Native Grape	Vitis cordifolia.
Canadian Moonseed	Menispermum Canadensis.
Ground-nut Wild Bean	Apios tuberosa.
Smilax Cat-brier	Smilax rotundifolia.

Native Trees.

Pin Oak	Quercus palustris.
Swamp Hickory	Carya amara.
American Aspen	Populus tremuloides.
Hornbean Blue Beech	Carpinus Americana.
White Birch	Betula populifolia.
Swamp White Oak	Quercus bicolor.
Basswood	Tilia Americana.
Beech	Fagus ferruhinea.
White Elm	Ulmus Americana.
Sugar Maple	Acer saccharinum.
Red Oak	Quercus rubra.
Butternut	Juglans cinerea.
Mossy Cup White Oak	Quercus macrocarpa.
Black Ash	Fraxinus sambucifolia.
Buttonwood	Platanus occidentalis.
Silver Maple	Acer dasycarpum.
White Ash	Fraxinus Americana.
Red Maple	Acer rubrum.
White Oak	Quercus alba.
Black Walnut	Juglans nigra.

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Slippery Elm.....Ulmus fulva.
Tulip Tree.....Liriodendron tulipifera.
Chestnut.....Castanea Americana.
Shell Bark Hickory.....Carya alba.
Corky White Elm.....Ulmus racemosa.
Balsam Poplar.....Populus balsamifera.
(Ba'm of Gilead)
Paper or Canoe Birch.....Betula papyraceae.
Chestnut Oak.....Quercus prinus.
Pignut Hickory.....Carya porcina.
Mountain Maple.....Acer spicatum.
White Pine.....Pinus strobus.
White Spruce.....Abies alba.
Balsam Fir.....Abies balsamea.
Hemlock Spruce.....Abies Canadensis.
Black Spruce.....Abies nigra.
Red Pine.....Pinus resinosa.
Larch or Tamarac.....Larix Americana.

Ornamental Shrubs.—(Native and Imported.)

Spireae Waterii.
Hydrangea Paniculata.
Berberis Thunbergii, Barberry.
Cydonia Japonica, Japan Quince.
Spireae VanHoutteii, Bridal Wreath.
Retinospera Plumosa, Aurea pisifera Filifera.
Aralia Spinosa, Anglican tree.
Philadelphus Grandifolia, Aurea Lemonii, Mock Orange.
Spireae Prunifolia.
Wigelia, Candida nana rosea.
Viburnum, sterilis, Pileatum, Snowball.
Prunus Pissardii.
Barberry, Purple-leaved.
Dwarf Almond.
Rhus cotinus, Purple Fringe, Smoke Tree.
Thuja pyramidalis.
Thuja Siberica.
Thuja Virvaroana.
Cornus Mascula variegata, Spaethii, Aurea elegantissimi.
Ribes Sanguineum, Flowering Currant.
Syringa Persian, alba purpura, Common lilac.
Deutzia, Pride of Rochester.
Sambusus argenta, Silver-leaved Elder.
Crataegus Paul, Double Scarlet Thorn.
Suspensa Virdissima, Forsythia Golden Bell.
Prunus Tribola, Double Flowering Plum.
Spireae aurea, Golden spireae.
Spireae Thunbergii.

REPORTS OF REPRESENTATIVES TO FAIR BOARDS.

Eastern Fair, Ottawa: Mr. R. B. Whyte reported that the appointment of a representative was a mere matter of form in his district, as no opportunity was given to criticise.

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Mr. T. H. Race, who represented the Association at the Western Fair, London, reported that that organization had now the best arranged horticultural exhibit in Ontario, and that they had succeeded in discarding everything from the prize list that was not worth being propagated.

Mr. Murray Pettit reported that they had succeeded in getting some changes in the prize list of the Toronto Fair, and had also obtained the appointment of some good judges.

The President said that the exhibition of a large number of varieties of fruit should be discouraged, and that prizes should be offered only for the more useful kinds. He had noted as many as forty varieties of apples on one of the lists.

It was moved by Mr. Race, seconded by Mr. Murray Pettit, That the Association expresses its regret at the absence of Mr. Thomas Beall, whose great services were well remembered, and would continue to be remembered by the Association, and that the Secretary forward to him a copy of this resolution. Carried.

Ordered that the revision of the Constitution of the Association and the re-arrangement of districts should be carried out by the Executive.

Moved by Mr. T. H. Race, seconded by Mr. Harold Jones, That the Horticulturist at the Ontario Agricultural College should hereafter be recognized as a member of the Board of Directors, as provided by the Agriculture and Arts Act, and that the Horticulturist at Ottawa be made an honorary member of the Board. Carried.

The Secretary presented a suggestion from the Minister of Agriculture, that the members of the Board should present a statement of their travelling expenses on the forms provided by the Department, as was required by the Provincial Auditor and in conformity with all other associations, instead of receiving their expenses in the form of a per diem allowance as hitherto. The Secretary was instructed to furnish blanks for such statements, and to carry out the Minister's wishes in the matter.

Mr. M. Pettit moved, seconded by Mr. G. C. Caston, That the Secretary be instructed to direct the Committee on Transportation to meet with the committees appointed by other associatins, the understanding being that each committee should appoint a delegate to wait upon the Government at Ottawa. Carried.

Moved by Mr. G. C. Caston, seconded by Mr. A. McNeill, that L. Woolverton be re-elected editor of the Horticulturist at the same salary as last year. Carried.

Mr. A. McNeill moved, seconded by Mr. R. B. Whyte, that the editor be requested to visit and write up for the Horticulturist the various Fruit Experiment Stations and other points of interest in Ontario, under instructions from the Executive. Carried.

The President announced the following committee on nominations: W. H. Bunting, G. C. Creelman (by the President); Harold Jones, T. H. Race, Murray Pettit (by the meeting).

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REPORTS OF DIRECTORS.

The following reports of Directors were presented by agricultural Divisions:

Division No. 1.

The representation of this division being vacant, no report could be submitted.

Division No. 2—R. B. Whyte, Ottawa.

I am sorry that I cannot report any progress in the way of organizing branches of this Society in the district I represent. As I endeavored to show our Secretary when corresponding with him last spring about this matter, District No. 2 is essentially a non-fruit growing district, outside of the section covered by the Ottawa Horticultural Society, and that the few who did take an interest in the subject were so scattered over the district that, in my opinion, as well as that of all those I consulted on the subject, any attempt to organize such societies could only end in failure under present conditions.

I am sure that not one in fifty farmers in my district grow any fruit, and not one in five hundred grows as much as he could and should grow. This apathy is the result of several causes, one of the chief being the number that have been swindled by tree agents selling varieties unsuited to the climate, the failure of which prejudiced the purchaser against all fruit growing.

Another is the mistaken idea that there is a great deal of labor connected with fruit growing. Another, that it is very expensive to start a fruit garden. This mistake has been fostered by the exorbitant prices asked for stock by many tree agents.

The great success of those who have taken up fruit growing intelligently has demonstrated that, with all our limitation, we can grow fruit satisfactorily and profitably over a large part of the district. In the vicinity of Ottawa great strides have been made in the last few years. One firm of seedsmen tell me that the demand for strawberry boxes and fruit baskets has increased tenfold in the last five years. The day is not far distant when our market will be supplied by the local growers with all it requires in small fruits, summer and fall apples, and some varieties of plums. Our climatic conditions are such that we can never hope to grow profitably the domestic type of plums, or such apples as Spy, Baldwin, King, or Greening; but the success of the Dominion Experimental Farm and some private growers has shown us what can be done, and the question for this Association is how to convey that information to where it is wanted—how to show the average farmer that he may grow, at small cost, all the fruit that his family can and should use.

This missionary work is most important, and deserves the most earnest consideration of this Board. I would like to suggest that it can be undertaken with the least expense and greatest efficiency by utilizing existing agencies. A speaker thoroughly familiar with local conditions should be sent to every Farmers' Institute meeting in the district, and also to every agricultural show in the fall, if not to act as judge, at least to assist the local judges, and at an advertised hour to give an address on fruit culture in the horticultural hall or other suitable place, using the fruit exhibit as a text, drawing attention to the varieties best worth growing, and how to

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get the best results from the fruit garden. I visited several shows last fall, and was surprised to see how many plates of fruit—some of them with prize tickets attached—were wrongly named.

If, in addition, an elementary bulletin on fruit growing was sent to every farmer in the district, giving simple instructions on how to plant and care for fruit trees and plants, the kinds most suitable to the locality, and what they should cost, I am sure gratifying results would be attained.

The good work engaged in by the Ottawa Horticultural Society for the last dozen years has been carried on with most satisfactory results during the past year. The membership never was so large, the monthly meetings so well attended, nor the interest shown by members so great as during the past season. Six exhibitions were held during the summer, and in almost every section of the prize list the competition was keen and the standard attained high. As in past years, the cordial co-operation of the horticulturist of the Central Experimental Farm added very much to the educational value of our exhibition. The great and continued success of the Society, where so many have failed, is most satisfactory testimony to the soundness of the principles on which it is founded and conducted.

Division No. 3.—Harold Jones, Maitland.

In January I attended the annual meeting of the Pomological and Fruit Growing Association of the Province of Quebec, as delegate from the Ontario Society, and conveyed greetings of good fellowship, joined in the discussions, and gave what help I could to the fruit growing industry in our sister Province.

In the latter part of the same month I attended two meetings of the Farmers' Institute in South Grenville, and spoke on fruit growing in its different branches.

In March I held five meetings in South Grenville, and organized as many local Fruit Growers' Association, obtaining a fair membership and working up quite a lot of enthusiasm and interest in the work.

During the summer I had numerous visitors to the Experimental Fruit Station, and was able to give demonstrations in pruning, grafting, budding, etc., also spraying demonstrations and instructions; in preparing the mixtures, and talks on insects, etc., all of which led to lively discussions, where questions were freely asked.

In September I acted as judge on fruit at two fall Fairs, and provided that the public be allowed admittance to the fruit building during the judging. A large number watched the work with keen interest, and when finished I encouraged the asking of questions and discussions on varieties which, I have been told since, led to much valuable information for those most anxious to learn.

Division No. 4.—W. H. Dempsey, Trenton.

I attended five metings in the early spring, and succeeded in forming local Associations at Trenton and Consecon. I also attended and judged at some of the fall Fairs, and answered questions. I also answered a good many letters during the season. I find that many are not willing to pay 75 cents additional for the "Horticulturist," when they get the Fruit Growers' Report as members of the Farmers' Institute. I encountered the same difficulty in getting members for the local Fruit Growers' Association.

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Division No. 5.—H. J. Snelgrove, Cobourg.

As Director for Division No. 5, I have the honor to report that in conformity with the arrangements made by your Executive, a series of meetings were held last spring, for the purpose of organizing local Fruit Growers' Associations. We succeeded in forming branches at the following places, viz.: Northumberland Co.: Brighton, Colborne, Grafton, Camborne.

Durham Co.: Bowmanville, Orono, Newcastle, Welcome.

At the same time practical demonstrations were given in pruning and spraying, and useful discussions took place upon subjects pertaining to general orchard culture. In connection with this pioneer work, I take pleasure in bearing testimony to the excellent services rendered by President Caston, and Inspectors Lick, Carey, and Vroom, whose clear and convincing addresses were thoroughly appreciated by those who heard them in this great apple district.

With a view of ascertaining the present status of the local associations in my district, which are now affiliated with this parent body, I addressed last month the following questions to the Secretary of each association, viz.:

"Dear Sir,—As I am required to preface a report on horticultural matters in this district, for publication in the annual proceedings of the Ontario Fruit Growers' Association, with which your local society is affiliated, will you kindly send me brief replies to the following questions:

"1. What is the total membership of your Society?

"2. Can you suggest anything to increase interest in the work of your Society?

"3. Indicate to some extent the commercial conditions of the fruit industry in your locality."

To these interrogations I have received replies as follows:

Brighton: F. D. Sanford. (1) Membership, 35. (2) Meetings of instruction, to be addressed by not only the fruit growers sent out by the Department, but also by the fruit Inspectors. (3) Orchards are not realizing as well as was expected of them, on account of the unusually large quantity of apples shipped in the early part of the season, and also owing to the spotted and defective condition of the fruit generally in this locality. As a rule, the later varieties are not so badly affected with the spot, and are expected to bring better prices.

Colborne: G. M. Peebles. (1) We have 30 names on our membership roll, but we have not as yet received any literature, circulars or bulletins, from the head office. (2) I think that might do good. (3) Apples constitute one-half of the export products of this locality.

Grafton: Thos. Hoskin. (1) Seventeen members. (2) More meetings, with good practical speakers who are not afraid to take off their coats and demonstrate what they preach. (3) Commercial conditions are fair, prices being low. The crop was large. Some damage was done by hail, and a great deal by scab, which was so bad in some orchards that the growers could not sell their fruit to the shipper, and were obliged to send it to the canning factory and evaporators.

Camborne: R. Cullis. (1) About 17 gave in their names, but only five paid their fees. (2) How to increase public interest seems to be a hard question to answer, because everybody nearly is looking for someone else to do the work, while they will receive the benefit. We must continue to work and agitate. (3) The commercial conditions of the fruit industry in this section are fairly good.

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Cobourg: Nearly 25,000 barrels of apples were stored here for shipment this season. As a rule, the grower received $1 per barrel for his apples on the trees. A few good orchards were sold en bloc. Although spraying was more generally resorted to last season than in any previous year, yet it was quite small in proportion to the total amount of orchard area. Result: those who sprayed effectively saved 90 per cent. of their fruit, while those who did not spray got from 60 to 75 per cent. The Baldwin was the only variety of apple comparatively free from scab.

Port Hope: A. W. Pringle. (1) Membership, 105. (2) The improvement of unsightly lots, street corners, and school grounds in our towns and villages. (3) Apple crop large; quality poor. Pears and cherries good. Plums fair. Prices poor.

Bowmanville: J. McLean. (1) Our membership is 37. (2) We have held only three meetings since we organized in May last. (3) I think commercial conditions have been pretty satisfactory, as apples sold mostly for $1 per barrel on the trees.

Orono: John Bickaby. (1) We have 13 members. (2) A meeting, with a couple of good speakers, as soon as the farmers' busy time is over, when the ground freezes up. (3) The 1902 crop of apples has been simply immense in this section. I cannot tell the time before when we saw such a crop. Over 75,000 barrels were put up in Clarke Township. There was a scarcity of barrels, and if the autumn had not remained open very late thousands of bushels would have been ruined. The price for winter fruit has been a dollar per barrel. We intend to have a meeting soon to stir up local interest.

Lindsay: F. J. Frampton. (1) Membership, 110. (2) Cannot answer. (3) Very little of the fruit grown in this locality is sent away. We have a good market in this town for all grown here.

I received no answers from Newcastle or Welcome, in Durham County, and, therefore, we are justified in concluding, I think, that the branches formed at those places must have died from an attack of cholera infantum, or else that the Secretaries appointed had dropped out of office.

The Horticultural Societies at Lindsay, Millbrook, Port Hope, and Cobourg, having a total membership of 350, are affiliated with this Association. It would be interesting to learn exactly why the other two horticultural societies in the district at Bowmanville and Peterboro', with a membership of 200, are not in affiliation with us. In my opinion, the Ontario Department of Agriculture ought to adopt regulations with the view of removing the nonconformity, inconsistency, and incongruity of the position occupied by those Horticultural Societies in the Province, which, although in receipt of the Legislative grant, have failed without any valid reason to combine and co-operate with this association in its great work of promoting in every way the most successful cultivation of fruit and flowers. I will venture to assert that any non-affiliated horticultural society will on close examination be found to be little better than a prize-package society, limited, into which each member puts $1, with the bargain-counter expectation that he will receive therefor $5 worth of plants, etc., not being so particular about quality as quantity. I certainly think that these so-called horticultural societies should be placed upon a higher plane of usefulness and public good.

I have met with some objections to the effect that the agenda of the Farmers' Institutes and the local Fruit Growers' Associations overlaps considerably; and we must admit that, as a rule, the intelligent farmers, who take an active interest in Institute work, are the same people to be found in attendance at the fruit growers' meetings. Many of them practice economy to such an extent that they object to paying a double membership fee. I

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can assure you that this duplication of fees is a stumbling-block to many. How are we going to get around it? is the question.

In reference to our official magazine, "The Canadian Horticulturist," some of the societies which I represent have requested me to ask the Board to reduce the subscription price of this magazine to 50 cents a year. I know you will agree with me when I say that "The Canadian Horticulturist" is most ably edited and conducted, both from a literary and practical standpoint; and it is a very valuable and admirable adjunct to the work of this Association; but everything betokens that we live in a great competitive age, and to keep up-to-date it is necessary ever to be on the alert and ready to adopt new ideas that are demanded by the spirit of the times. Now, when our horticultural societies are being offered such garden and orchard publications as I here lay before you, at clubbing rates of 15 cents and 25 cents a year, I respectfully submit it is only natural that they should object to paying 80 cents a year for our magazine.

A supposed invasion of the dreaded San Jose scale was reported to me from the Baltimore Hills. I immediately sent a specimen to Inspector Fisher, who had the pleasure of advising me that it was the Putman scale. I believe the district to be entirely exempt from the San Jose scourge.

To show the enormous value of the apple industry to the County of Northumberland—just one of the four counties comprising my district—I obtained from the Collector of Customs at Cobourg the total quantity and cash value of apples exported from Cobourg and its outposts: Brighton, Colborne, and Grafton, during the three last fiscal years. I find that during this triennial period 204,000 barrels of apples were shipped to Great Britain, Germany and the United States, representing a total monetary value of $616,130, or a yearly average of 70,000 barrels, at $238,710.

I also desire to point out that this county contains the largest and most complete packing and storage houses in the Province, affording room for 250,000 barrels at one time. This immense accommodation is taxed to the utmost, notwithstanding the erection of new depots each season.

I also find that, according to the figures furnished by the Bureau of Industries, Northumberland has 570,729 apple trees set out, and that the district as a whole can boast of having more than one-tenth of the 10,000,000 trees growing in the Province.

In conclusion, after serving this Association to the best of my humble ability during the year that is now closing, I realize more than I ever did the ineffable pleasure emanating from work which brings one in touch with Nature, who never did betray the heart that loved her, and would exclaim, with Whittier:

"Give fools their gold and knaves their power;
Let fortune's bubbles rise and fall;
Who sows a field or trains a flower,
Or plants a tree, is more than all.

For he who blesses most is blest;
And God and man shall own his worth,
Who toils to leave as his bequest
An added beauty to the earth."

Division No. 6.—Elmer Lick, Oshawa.

Six meetings were held in my section, but no organization was effected. In some sections the farmers were more or less apathetic towards the orchard; but this is not true of all, as some parts of the district I represent are pretty good apple sections. I also met the complaint among farmers that they could not afford to belong to too many associations. This was particularly the case in Wexford and Oshawa.

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Division No. 7.—Murray Pettit, Winona.

The first work of importance done in our division was the calling of a meeting to discuss some better means of fighting the San Jose scale. As a result we formed a deputation to wait upon the Minister of Agriculture, and urged upon him the desirability of amending the Act so as to give municipalities permission to pass by-laws appointing inspectors, the municipality to pay half the cost and the Government half. This amendment was passed by the Legislature, and, in accordance therewith, we appointed fifteen inspectors, who went thoroughly through the locality locating the scale. In consequence, excellent work has been done in the direction of controlling the scale, and in some cases entirely exterminating it.

We held meetings in six places. Mr. McNeill assisted me, and we gave practical demonstrations in pruning and grafting in the orchard. In four places we had a good attendance, and much interest was shown. We also held a meeting at Fruitland, at which Prof. Hutt gave an address on pruning, grafting, etc., which was very successful.

Division No. 8—E. Morris, Fonthill, and W. H. Bunting, St. Catharines.

We have the honor to submit a brief report of the conditions, with reference to the fruit industry, that have characterized the season of 1902 in Agricultural Division No. 8 in this Province.

The year which has just closed has been, upon the whole, a favorable one for the fruit growers in this district. Notwithstanding that severe frosts in May seriously threatened, and in some localities destroyed a portion of the fruit buds, and the continued cool, wet weather prevailed during the entire summer, and that occasional hailstorms destroyed many crops in some localities, still in nearly all varieties of fruit a comparatively full crop was safely harvested and disposed of in the markets at fairly remunerative prices to the producer.

With the single exception of grapes and apples, all the other fruits were in large supply and of good quality. With regard to grapes, the May frosts seriously injured many of the buds, and fungous diseases still further reduced the final output; in consequence, the wholesale price of the marketable crop was considerably enhanced. Apples, while an unusually heavy crop, were so badly affected with the apple scab in many orchards as to render the fruit comparatively worthless. This condition of affairs was very much in evidence in orchards where spraying had been neglected. The value and importance of careful, thorough, and constant spraying has again been clearly proven during the past season.

While the year has been favorable for the development of fungous disease, it has not been so conducive to the increase and production of insect life. The various insects injurious to plants and fruits have not been so numerous as during some previous years, and, in consequence, reports of injury by insects have been less frequent.

Several orchard meetings in the afternoon, followed by evening sessions, were held during the month of May under the auspices of this Association. These meetings were fairly well attended, and much valuable information with regard to improved methods of orchard treatment was gained by those who were present.

There are several local organizations of fruit growers in this district, which are doing very good work, but we regret to say that these societies and associations do not seem to be as fully alive to their opportunities and possibilities as might be desirable. It is hoped, that in co-operation with the Provincial Association in the near future, these local societies may become more useful and aggressive in the great work of advancing the fruit industry of the Province.

WM. H. BUNTING.

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I beg to report as follows the condition of the fruit industry for 1902 in Division No. 8, comprising the Counties of Lincoln, Welland and Monck.

I wish to call attention to the fact that the southern part of my district has been neglected. The Society never held a meeting south of St. Catharines, nor have any orchard meetings been held there. There is no section in Ontario where the people would more gladly receive the information afforded by these meetings, and I hope that the Society will favor the district with a few meetings during the coming season.

All yields of small fruits, with the exception of grapes and blackberries, have been the largest known for years, selling for good prices, and the demand equalling the supply. One grower in Pelham (Wm. Platts) making a net profit on strawberries of $3,000, probably the profits of other growers are equally as good, proportionately to the extent of their plantings and care given to the crop. The profits in the growing of raspberries would be much larger if growers would renew their plantings more frequently.

Grapes were much damaged by two hailstorms through portions of this division, but the increased price made up for shrinkage in quantity. European plums were a failure, owing to rot; peaches a large crop, except in sections where the hailstorms destroyed about two-thirds of the fruit. Prices fair.

All varieties of pears were heavily laden with fruit of good quality. Apples, heavy crop, but badly affected with scab; only about 50 per cent. were saleable. The following varieties were comparatively clean from scab and worms: Salome, Sutton Beauty, Stark, and York Imperial.

The farmers of Welland and Monck Counties do not give their orchards the care and attention necessary to produce good fruit, and have not had the benefit of orchard meetings. I hope, however, that during the next season the Society will arrange for such meetings, to be held in the neighborhood of the following towns: Ridgeway, Marshville, Niagara Falls South, and Fonthill.

E. MORRIS.

District No. 9.—J. S. Scarff, Woodstock.

In presenting my report I have much pleasure to state that the Woodstock Horticultural Society is steadily growing in public favor. We have a membership of 98, each of whom receive "The Canadian Horticulturist," with the plant distribution from the Fruit Growers' Association; also distribution from the local Horticultural Society during the year to the extent of $60 worth of premiums.

The year 1902 has been somewhat unfavorable for horticulture in many respects, owing to late frosts in the spring, and the long-continued wet weather through July and August, which was very irregular and uncertain for floriculture. The Society holds open meetings monthly, when the public are invited to attend. Many papers on horticultural subjects have been read and discussed, with a great deal of interest and instructiveness. By co-operating with the School Board, have aided materially in the work of beautifying and improving the public school grounds in the way of flower beds, with bulbs, and later on with tropical plants and annuals; also at the suggestion of the Horticultural Society planted a large number of shrubs and evergreens at the Central School grounds, which will in a short time add very much to the attractiveness of the grounds. In addition to the

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above, the Society have distributed to the school children this year, to three pupils in each department of the Central and Ward Schools, a number of plants, such as asters, zinnias, phlox, petunias, and geraniums, which were distributed free to the scholars on condition that they should exhibit the flowers from them at the fall exhibition of the Society. In this way from eighty to one hundred pupils received plants and made exhibits.

The visit we had in March last from A. Gilchrist, Toronto Junction, and Mrs. Torrance, Chateauquay Basin, Quebec, was very instructive, and had a very beneficial effect on the school children, and was very much appreciated by the local Society.

In the County of Oxford the apple crop has been inferior this year, owing a great deal to the very wet weather and so little spraying done. The fruit was very scabby. The yield has been fully 70 per cent. greater than last year. In some parts the apple crop was very much injured by hail. As a matter of fact, the great trouble is a large proportion of the growers do not realize the importance of spraying.

Division No. 10.—W. W. Cox, Collingwood.

Georgian Bay Fruit Growers' Association.

On December 11, at the annual meeting in Collingwood, I had the honor to be elected Secretary. At this meeting discussion took place with regard to future work of Association in exporting, in shipping, and in selling; action with regard to unjust discrimination in transportation rates; the importance of agitation for reduction of rates, and action to prevent the successful cornering of apples.

With regard to co-operation, the ideas were embodied in a circular, of which five hundred were distributed in this section, and also printed by the "Sun," "Farming World," and "Farmer's Advocate." This helped to awaken the fruit growers to the importance of the subject, and incidentally gave the Georgian Bay District considerable free advertising:

DEAR SIR:—So far as I have been able to ascertain, it is the general wish that this Association do something with regard to the co-operative buying of packages and chemicals; with the object of placing orders in the slack season thereby obtaining a reduction in prices and also with regard to Paris green and bluestone, buying from a reliable firm upon a guaranteed analysis.

I would suggest that barrels be bought from the cooper who will give your local Association the best terms, that boxes be ordered from the factory by the General Secretary and billed to each local Secretary while chemicals may be bought in the same way from the wholesale houses, or each local Association may buy from their own local dealer as may be shown to be most advantageous.

In order that I may have a guide as to what the members wish, would you kindly fill out the enclosed blank and forward to me. The price mentioned means the highest price you are willing to pay. We would get the best terms possible in proportion to amount ordered.

We will be glad to have you make any suggestions which you consider would be for the general welfare of the Association. Let us have your ideas upon prospective work such as co-operative buying of supplies and also trees in quantity so that we may get both reduction in price but more especially to buy on a guaranteed bond that they will come true to name, transportation rates, care of orchards, packing, grading and selling of the fruit, the establishment of an information bureau, to give special attention to collecting data on the discrimination of railway companies and also to keep our members informed as to fruit prices and any other matters of interest to fruit growers.

Yours truly,

G. FRED MARSH, Sec'y.Treas.

P. S.—If you have not already paid your fee for this year you may enclose the 25c at the same time, which will entitle you to all the advantages of the society together with the report of the Fruit Growers Association, the Experimental Fruit Stations and all bulletins of interest to fruit growers issued by the Agricultural Department.

I agree to take the following stock to be delivered at the undermentioned place and at prices not to exceed those mentioned below.

.....Apple Barrels	at.....each	Delivered.	.....1902.
.....Apple Boxes	at.....each	Delivered.....	.....1902.
.....Fruit Baskets	at.....each	Delivered.....	.....1902.
.....Pounds Paris Green	at.....per lb.	Delivered.....	.....1902.
.....Pounds Bluestone	at..... per lb.	Delivered.....	.....1902.

Signed..... .....

Place of Delivery..... .....

Suggestions—

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A resolution calling for the appointment of a Railway Commission was passed, and sent by the Secretary to the Hon. the Minister of Railways, the members of Dominion Parliament from the section, and also to the clerks of each town and municipality in Georgian Bay District, asking that they co-operate by passing same.

The Minister of Railways and members sent very nice letters in return, while those interested in the municipalities paid no attention whatever to the resolution. This simply shows that Parliament will give us whatever we want just as soon as we show that we are in earnest, and will take united action, showing by our votes that we will support a man who will come out and work for our interests.

In March, owing to the kindness of Mr. Creelman, we were fortunate in securing the services of Mr. Hutt for a series of meetings at Meaford, Clarksburg, Stayner, Creemore, and Collingwood.

I had the pleasure of attending these meetings, and helping them along in a small way. They were certainly productive of much good, and many orchards were trimmed and grafted. Owing to this visit, thousands of dollars will, in a few years, be added to the value of fruit in the district.

A little later we had a flying visit at Thornbury from the chief of the fruit division at Ottawa, Mr McKinnon, who was so strongly impressed with the importance of the Georgian Bay District that he, in conjunction with Mr. Creelman, sent Messrs. McNeill and Carey for a series of meetings at Meaford, Clarksburg, Collingwood, Stayner, and Creemore, giving practical demonstrations in spraying, and giving better methods of packing and shipping. A pleasing feature of these meetings was Mr. McNeill's talks on Nature Study, to the school children.

In July, Mr. J. H. Sparling, Superintendent of Canadian Express Co., and their travelling agent, Mr. Allen, for this section, met our Association in Collingwood. Owing to the notice being very short, very few were able to attend. However, we had a good meeting, which was productive of about 20 per cent. decrease in rates to north, and also the improvement of shipping facilities at Thornbury, where a platform 25 feet long on a level, with the car on one side and the wagons on the other, was built, with a roadway across the track, where before it was necessary to take it by hand across in trucks.

Very little was done with regard to co-operation in buying of packages, though both coopers and basketmakers offered large reductions, and we hope to have a large order in time for next year.

Great interest has been manifested by the people in the Association, due largely to the advertising, a considerable amount of which was free, in the way of short editorials and locals, generously given by the local papers and agricultural journals, especially the "Farmer's Sun," Toronto. To all of these the Society is deeply indebted.

The membership is rapidly increasing, and now numbers somewhat over two hundred, though we have not been able to obtain full reports from local secretaries.

In closing, we must remember the generous gift of twenty dollars by the West Simcoe Farmers' Institute, which has relieved the Secretary's mind by turning an alarming deficit into a surplus.

We also urge the importance of the Fruit Growers' Association being placed upon the same standing as the Farmers' Institute, and being given an annual grant from the Department of Agriculture, as this is absolutely necessary if the Association is to continue to do good work.

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Report of Creemore Branch.

The annual meeting of the Creemore Branch of the Georgian Bay Fruit Growers' Association was held at Leonard's Hall, Creemore, on November 30th, 1901. The Executive officers appointed were as follows: President, I. J. Honsberger, of Banda; Vice-President, W. T. Pattullo, of Creemore; Secretary-Treasurer, F. E. Webster, of Creemore.

At the annual meeting subjects that were up for discussion were: "Railway Rates." "Co-operation in the Sale of Fruit," "Orchard Management," and "Desirable Varieties of Fruit to Grow." Mr. I. J. Honsberger was delegated to attend the meeting of the Ontario Fruit Growers' Association, held at Cobourg.

On February 15th a meeting was held, where an extended report of the Fruit Growers' Convention at Cobourg was given by Mr. I. J. Honsberger, which was followed by an interesting discussion. Railway rates again came up for discussion, and it was resolved to petition our representative to support any measure in the House that would lead to the appointment of a railway commission.

Three orchard meetings were held. The first was held in Mr. W. T. Pattullo's orchard, near Creemore, on March 15th, 1902. A demonstration on orchard pruning was given by Mr. W. N. Hutt. The day was fine, and the attendance was over one hundred. This orchard meeting was intensely interesting to the farmers, and produced splendid results.

The second orchard meeting was held in Mr. W. T. Pattullo's orchard, on May 26th. Mr. Alex. McNeill was the principal speaker. He lectured on spraying to destroy the many fungous diseases and injurious insects. Owing to the farmers being very busy at home, the attendance was not over forty or fifty.

The third orchard meeting was held in the orchard of Mr. Robert McMann, of Mansfield, on May 27, 1902. The attendance was about one hundred. Great interest was taken in the practical lecture delivered by Mr. Alex. McNeill.

I might observe that the orchard meetings seemed to be of far more practical benefit than meetings held in halls. A tramp through the orchard looking for beneficial and injurious insects, and a talk on methods of destroying bad insects, a general discussion on each fruit tree as it is passed by, and the results of cultivation and fertilization of the different fruit trees, all these seem to make such lasting impression on the farmer that he carries the knowledge he gets home with him, and he does not forget it.

A meeting was held in the Matchett House, Creemore, early in September, for the consideration of "Co-operative Shipping of Apples" among the farmers. After much discussion it was decided to take no action this year.

The year closed with a membership of forty-nine.

All of which is respectfully submitted.

F. E. WEBSTER, Secretary.

The President: I will call upon Mr. Sherrington for a few remarks in this connection, as he has taken a great interest in organizing in Huron and Bruce.

Mr. A. E. Sherrington, Walkerton: The first work with which I was connected was the organization of a local Horticultural Society in Walkerton, where we formed a strong association, with eighty members. In accordance with a request received from the Secretary, I arranged a series of orchard meetings in the spring, covering the two counties. The points selected were

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Port Elgin, Walkerton, Lucknow, Blyth, Clinton and Hensall. I was assisted at these meetings by our President, and we had fairly large attendances, especially at Walkerton, Port Elgin, and Blyth. At these points local Fruit Growers' Associations were organized. There was the greatest of interest taken in the work of pruning and grafting. I do not think there is any work the Association can take up that will be of greater benefit than this. Men from the lower part of the county have since said to me that they have done all their own grafting this year, and did not know how to do it before. They also report having shown many others how to do the work.

In May we held a series of meetings on Spraying, assisted by Mr. McNeill. I could not attend all these meetings myself. These meetings were well attended, and a great deal of interest was taken. I also called a meeting for Teeswater, and organized a local Association there.

With regard to our local Association at Walkerton, we have held a meeting every month except one, and that evening it was too wet for anyone to turn out. We discussed fruit culture in all its branches, and then took up the subject of co-operation. As a result, we bought all our spraying material on the co-operative plan, securing half a ton of copper sulphate and Paris green. In that way we got first-class material. We heard complaints of Paris green not being up to the standard in different parts of the Province, while ours was of the best quality. We also got it at greatly reduced rates.

Then we undertook to co-operate in the shipment of our apples. Each grower packed his own and put his name on the barrel. The results were satisfactory, and we intend to continue the co-operative work. We are now discussing a cold storage and storehouse for this town, which is to be located near the station, and will enable us to ship our peaches, etc., at any time we desire.

Mr. Creelman: Is this being undertaken by the local Fruit Growers' Association?

Mr. Sherrington: Yes.

Mr. Creelman: Do you think a twenty-five-cent membership fee too much for that?

Mr. Sherrington: I do not think it is enough.

Mr. Creelman: Does the Farmers' Institute interfere with the work?

Mr. Sherrington: No; nearly all our members are members of the Farmers' Institute. As a result of co-operation we got 50 cents on all our apples, while outsiders complained that they received only about 26 cents for No. 2's and 60 cents for No. 1's.

Q.: What caused the difference in price?

A.: It was the extra charges of the dealers. By co-operation we made $1.75 f.o.b. on our apples. I think we should get the local associations affiliated with the central Association, and that it would result in much good.

Division No. 11.—T. H. Race, Mitchell.

The principal work done in the interests of our Association in District No. 11 during the past year was through the regular and supplementary meetings of the Farmers' Institute; in the former Mr. Elmer Lick, and in the latter by Mr. W. N. Hutt. It would be a mistake to say that the work was either unimportant or indifferently done. It was very valuable work, and most excellently performed.

In the regular meetings Mr. Lick dealt with the picking, packing, and shipping of apples, and also with the Fruit Marks Act. His addresses were all so instructive and valuable that he got the closest attention from his hearers everywhere, and it is needless to say that he gave them a much

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more intelligent idea of the nature and purposes of the Fruit Marks Act than they had previously entertained. The good results of his talks have been seen in the packing and shipping of apples this fall.

In the supplementary meetings, Mr. Hutt gave a very valuable address, accompanied with a practical demonstration on pruning. This object lesson, with Mr. Hutt's practical talks, provoked a lively interest wherever it was seen, and its tendency will be to promote a greater interest in caring for the orchard.

A greater interest has also been manifest in the local Horticultural Societies, in the planting and cultivation of shrubs, flowers and small fruits. In some cases this interest has reached the point of enthusiasm, notably in London, Stratford, and Mitchell, where strong and active societies have come into existence within the last three years. The good work thus far done, and the interest promoted, will amply justify the continued efforts of this Association in its aid and encouragement thereto.

Division No. 12.—Alex. McNeill, Walkerville.

I wish to endorse what has been said about orchard meetings. I believe that they are, perhaps, the most helpful form of work that this Association has undertaken.

We held five or six special meetings in our district, and, with one exception, had a fair attendance at all of them. Mr. Hilborn and myself attended, and gave practical demonstrations in pruning, grafting, care of trees, soil culture, etc. We also directed attention to insect pests and fungous diseases, and the remedies for them. We have three local Horticultural Societies in our district that are all doing good work. I do not think that we should cut off the ornamental part of their work, although we might sub-divide if necessary, and I would suggest adding forestry and vegetable growing.

The Fruit Division of the Department of Agriculture at Ottawa, which I represent, is a comparatively new departure. Its chief work hitherto has been in enforcing the Fruit Marks Act, but I do not think that it will be its ultimate work. I think there should be co-operation between the Fruit Division and the Fruit Growers' Associations, both local and Provincial. I hope steps will be taken to effect this. The scope of the work of this Department will depend on the people themselves, and upon what use they make of it. I have no confidence in any organization that is not founded on the will of the people, and I believe you can make this Department of great interest to our fruit growers.

District No. 13.—C. L. Stephens, Orillia.

I am asked to make a report on horticultural and fruit growing, covering the County of Simcoe, Muskoka, Parry Sound, and Algoma, and this without having been provided with "ways and means" which might enable me to do so. However, by correspondence I have been enabled to procure some information, which may be of interest to the meeting.

In the County of Simcoe there are 14 Agricultural, and 4 Horticultural Societies; in Muskoka 9, Parry Sound 12, and Algoma 12 Agricultural Societies. All of these Agricultural Societies, doubtless, at their exhibitions have classes for flowers, and most of them for fruits, and award prizes in these branches, thus, in a measure, doing work on the lines of this Association. So far as the societies at Coldwater, in Simcoe, and Bracebridge, in Muskoka, are concerned, I have a personal knowledge that they have very superior exhibits in these classes. The Barrie and Orillia Horticultural Societies

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have for many years been engaged in these directions, and have been the means of largely promoting the growth of the different fruits in their localities. I am not familiar with what has been doing in Collingwood and Midland by the Horticultural Societies, but, doubtless, valuable work has been done. Fifteen years ago there were not apples enough grown about Orillia for local consumption, whilst this year, so far as I can learn, about four thousand barrels were shipped out, and the home demand well supplied. The total shipments from East Simcoe would probably reach over twenty thousand barrels. The most of these would be early apples, chiefly Duchess, for which a large and increasing market is found to the northward, nearly every station on the C. P. R. from North Bay to Winnipeg taking its quota. Wealthy, also, we can send to the north; but it is not so well liked as Duchess; for the latter apple there is a great future in this trade. Up to the present there is not a great supply of winter apples for shipment from Orillia; but the quantity is increasing yearly; this year I have heard of several farmers setting out 400 and 600 trees. Mr. J. P. Cockburn of Gravenhurst, Muskoka, grows a great many varieties of fall and early winter apples with much success, and is doing a great deal in testing the capacity of Muskoka to grow good apples. There are two experiment stations in this district, one under the charge of our esteemed president, Mr. G. C. Caston, in this county, and one on St. Joseph's Island, in Algoma, in charge of Mr. C. Young. I have never had the pleasure of visiting either of these stations, and have no personal knowledge of the work carried on by them. In this connection I would suggest that when the annual inspection of experimental stations is being made, it should be part of the duty of the local Director in each case to accompany the inspecting officer, and that his necessary expenses in doing so should be paid.

During the summer the Orillia Horticultural Society arranged a visit from Prof. Fletcher, and that gentleman gave a very instructive and interesting lecture on injurious insects.

Progress of Fruit Growing in Muskoka District.

After crossing the Severn River, the soil and climate changes materially. The soil and rock of this district is generally warm, by reason of the composition, the granite formation being a great absorbent of heat; so that during the growing season vegetation is rapid. Therefore, it is not well to encourage too rapid growth in trees, as they are sure to suffer in winter. However, the many troubles we have had in the past are now practically overcome. We have a better knowledge of the class of plants likely to succeed; in short, we must acclimatize and winter trees and stock, so as to bring it through the winter (sometimes 30 deg. below zero) with strong, healthy buds. Then we may expect a fair crop of a number of the standard sorts of apples. The following have been most successfully grown, the specimens generally being the best of their kinds:

Summer: Duchess, Yellow Transparent, Red Astrachan, St. Lawrence, and Trenton; for later crop, Wealthy, Sally Brown.

Fall: The Beautiful McIntosh, Longfield, and several very valuable seedlings (local).

Winter: Golden Russett, Pomme Grise, Labrador, Pewaukee, Scott's Winter, Nora, and Minto.

We have a number of most promising seedlings grown by observing people here, to wit, the Rev. W. Reeve, W. N. Moody, James Brydon, Wm. Jarvis, J. W. Slater, James Brown, and myself. Many of these seedlings should be propagated by some local nurseryman, to the benefit of the nur-

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seryman and the lasting benefit of this district, and the cold north up to James' Bay. As it is, we have been practising and experimenting in our own quiet way till we have made a partial success of growing the most beautiful apples to be seen on the market anywhere—to wit, My Own Russett, which was so successful at the Pan-American. At our high school practical botany and forestry is made one of the features. We are thus whetting the powers of observation and fixing an intelligent foundation for future success in the rising generation of fruit growers at our practical lessons in pruning, grafting and budding. The girls join with as much enthusiasm as the boys, and make a great success of their work.

Last winter being a very mild one, the buds on the Domestica plums came through in fine form; in consequence, we had many fine lots of plums, the best of which were Lombard. Reine Claude gave some fine fruit; Moore's Arctic was overloaded; so also were Genii. The Yellow Egg and this class rotted very badly. A seedling Americana, very dwarf one, gave the best crop of fine plums, followed by Hawkeye, Wolff and Stoddart. The only advantage in these over our own Nigra is that they bloom later, and thus give us a double chance of missing the frost.

There are many of the Nigras well worthy of a place on our lists for the north, notably the Stormont, a fair size, yellowish red plum, with very little astringency, but plenty of stone—and some delicious pulp.

PUBLIC MEETING.

The proceedings at the public meeting (President Caston in the chair) began with an address from the Mayor of Walkerton, Mr. C. W. Cryderman, in which he extended to the Association the sincere welcome of the town. In the course of his remarks he said that he could point with pride to the fruit resources of the County of Bruce. The natives considered their county one of the bright spots of the Province. It was not one of the northern counties, as was too often supposed. They were in about the same latitude as Toronto, and could raise just as good peaches as were grown in the Niagara district. All the people needed was a little encouragement, and they would undertake to grow fruit for their own pleasure and profit, and in this connection he congratulated the Society on the work it was doing.

Judge Klein ably seconded the efforts of the Mayor to make the Association feel at home. He pointed with pride to the fact that for thirty years they had had a Horticultural Society in the town. It had now affiliated with the local Fruit Growers' Association, and for every dollar paid in for membership, they were receiving fourfold. The Fruit Growers' Association was not like the various commercial associations in its character—it had no trade secrets. He was very much impressed with this fact; all were willing to impart the knowledge they had acquired in the pursuit of their vocation, and thus advance the interests of fruit growing generally.

Mr. A. Shaw, K. C., said that, although he was a lawyer, he owned a farm and an orchard, and might be considered a sort of agricultural lawyer. Nature in all its aspects was particularly attractive to him, and there was nothing he took greater pleasure in than the growth of trees, shrubs, and flowers. Had it not been for the beauty of the forests of that county in the early days, he did not think he would ever have settled down there. He had been in every Province of the Dominion, and believed there were no trees anywhere that equalled those of Bruce and Huron, not because they were the largest, but because of their straight, clean, healthy growth.

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Since the days of early settlement the farmers had been busy cutting down the forest, until, he was sorry to say, it had almost disappeared. For his own part, he had been busy planting trees for the last twenty years, and intended to continue the work. In referring to the fact that American visitors were present, he said he was not one of those who would forever be celebrating Lundy's Lane and Queenston Heights, thus keeping alive the quarrels of the past. It was much better to meet our American friends in conferences such as this, that had for their object the advancement of an industry important to the well being of so large a section of the community.

President Caston, in his reply, thanked the speakers for their cordial words of welcome. He agreed that the residents of Bruce had the soil and climate necessary to make the district a great fruit growing country. There was no part of Ontario capable of producing apples of higher quality. He hoped that those interested would take full advantage of the sessions held, which, he pointed out, were open to all comers. He then delivered his annual address as President.

PRESIDENT'S ADDRESS.

By G. C. Caston, Craighurst.

Another year has rolled aronnd since our last annual meeting, and it becomes my duty to review the labors of the year, and to present some thoughts upon the topics that are likely to be of interest to us as an Association. But I would like to go a little farther back than the year that is just passed, and briefly to take a retrospective view of the work of our Association in the past, what it is doing at the present, and to offer a few suggestions as to the future.

On the 19th of January, 1859, in the Mechanics' Hall at Hamilton, our Association had its birth. The late Judge Campbell, of Niagara, was its first President. But of the first Board of Directors, only one now remains in the land of the living, and its was quite in accordance with the eternal fitness of things that the Association last year made him an Honorary Director for life. I refer to the veteran, Mr. A. M. Smith, of St. Catharines. Fruit growing for profit was little thought of or practised in those days, except in a small way in a few favored localities, and the little band of fruit growers, in laying the foundation of this Association, struggled against many difficulties and discouragements. But it may be said of them, that they builded greater than they knew. They held meetings at various places for discussions on fruit culture, and made exhibits of fruit, and although the attendance was small, and the membership in '68 only amounted to 30, yet a great deal of useful information was brought out, and the success in fruit culture in this Province which has followed may be said to be due to the efforts of those few men more than to any other agency.

In 1868, through the efforts of Mr. W. H. Mills, then President, and his co-laborers, the Society was incorporated under the Agriculture and Arts Act, and became entitled to a yearly grant of $350, which enabled the Society to enlarge the scope of their work. Meetings were held in various parts of the Province. Experimental work was begun in a small way by sending out to members every spring a premium in the shape of some new variety of fruit, flower or shrub, to be tested in the various sections of the Province. Then soon followed the publication of The Horticulturist, our monthly journal, which from small beginnings is to-day one of the best

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of its kind. The editor is a horticulturist to the manor born, who has devoted his life to the study and practice of fruit culture, and he has the assistance of some of the most experienced men in the Association. Our membership has increased from the little devoted group of 30, in 1868, to 4,950 in 1902. In the Province of Ontario to-day there is nearly half a million acres in orchard and garden, over 11,000 acres in vineyard, over 7,000,000 apple trees, 15 years and over, with a total yield of 37,000,000 bushels, and over 4,000,000 trees under 15 years. Great improvements have been made also in the methods of handling fruits and in packages. In the early days berries were brought to market in pans and pails, jolted over the roads in heavy waggons, and reached the market in a condition ready for jam. Apples were carted to market in bags and old barrels. We now have attractive, clean, new baskets and packages for every kind of fruit, which are being constantly improved from year to year. But the work of the Association has not been confined to the development of fruit culture alone. Arboriculture, floriculture, and landscape gardening, those pursuits that beautify and adorn the home and its surroundings, have received a large share of attention, both at our meetings and through our journal. And who will say that the improvement noticed throughout the country in this line does not owe its inception and progress very largely to the work of our Association?

But while we have made great progress, it has not been all plain sailing. There has been many discouragements and hindrances to contend with. Fungous diseases, blight, mildew, black knot, and yellows have visited us. In some years unusual climatic conditions and a host of insect foes keep the fruit grower ever on the alert, in order to hold his own. But the methods disseminated by our Association for dealing successfully with these pests, and the assistance given by the Department of Agriculture, particularly in the case of the San Jose Scale, the most dangerous pest of all, must, I am sure, be a source of gratification to every one interested in the industry of fruit growing.

Our Association has also played a very prominent part in the proud achievements of our Province at the various international exhibitions. At the Centennial at Philadelphia, in '76, at the Intercolonial at London, at Chicago, at Paris, and at the Pan-American. The laurels won at these exhibitions by our fruit growers has done much to elevate our country in the estimation of the world, for our achievements in this line, while a matter of pride and gratification to ourselves, has been no less a matter of wonder to others. People naturally conclude that a country which can produce such a variety of fruits of the highest excellence, must be a good country, a fertile country, a country of sunshine and of favorable climatic conditions, and withal a pleasant land to live in.

Through the efforts of this Association much useful legislation has been initiated and placed upon the statutes of the Province, such as the Act for preventing the spread of black knot and yellows, the Act respecting the bandaging of trees for the destruction of the codling moth; and also the Fruit Marks Act, though a Dominion law, and having a wider scope, is the result of the continued and persistent efforts of this Society. We have been able to enlist the aid of the Department of Agriculture in giving object lessons in spraying fruit trees for the prevention of fungous diseases and insect pests, lessons which have been of incalculable benefit to the Province. Also in the transportation of our perishable fruits, through the valued assistance of the Dominion and Provincial Departments, we have made great progress, and from what has already been accomplished, in

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the way of cold storage, ventilated compartments, etc., it is safe to say we are on the high road to success. In the matter of freight rates we have been able to secure some concessions in the way of classification and some slight reductions in rates. We have found the transportation companies and their rates a difficult problem to deal with, and we have to keep ever and always at them.

And just here I would like to draw the attention of the Association to the movement now on foot by the railway companies to ask Parliament to permit them to increase their rates. I may say, from correspondence I have had, that we will be asked to co-operate with other Associations in opposing this movement. We will be remiss in our duty if we fail to do it, and I hope this question will receive the serious attention and consideration by this meeting that its importance deserves.

The year now drawing to a close has been a fairly good one for fruit growers. Small fruits benefited by the abundance of moisture, and bore an abundant crop, and prices were pretty well maintained. Tree fruits were not uniform throughout the country. In some sections plums and cherries were abundant, and in others a failure. In the peach belt a good crop was harvested, and prices held good until near the close, when, owing to the lateness of the season, prices dropped considerably. In apples, which is our staple crop, there was also a curious lack of uniformity. Early apples were well up to or over the average, but winter apples were below the average in quantity, and were very much below in quality. Some orchards were bare, while others in the same section were fairly well loaded. A great deal of damage was done by the prevalence of scab and other fungous diseases. The frequent and heavy rains prevented effective spraying.

Yet those who were fortunate enough to have a good crop of apples of good quality have been able to realize good prices for their fruit. Owing to the scarcity of apples in Europe, all those arriving in sound condition realized good prices. It is seldom that fall apples and early winters realize as good prices as obtained this year.

And now a word about the work of the Association during the year. At the last annual meeting, as many of you are aware, Mr. Woolverton asked to be relieved from the duties of Secretary-Treasurer of the Association, in order that he might be able to devote more time and attention to the editing of our journal. This request was complied with, and we were fortunately able to secure the services of Mr. G. C. Creelman as Secretary-Treasurer of our Association, a man well known throughout the Province as Superintendent of Farmers' Institutes, and also for the zeal, energy, and executive ability he brings to bear upon this work.

A committee was appointed, composed of some of our best men, to act as a sort of Advisory Board, and as a result of this division of work our journal has been improved, until it is now one of the best of its kind published. The Association has been able to enlarge its scope, and develop a great deal of new work which cannot fail to be of great benefit to the fruit interests of the Province

It has been felt for some time that our Association should in some way seek to get in closer touch with the individual fruit growers of the Province; also that there was need for a great deal of educational work, and that no educational work was of such value as object lessons given in the orchard.

On the initiative of Mr. Creelman, the Executive secured a small grant for this purpose, and decided to undertake work along this line. During March and April 45 orchard meetings were held, where lessons were

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given on pruning, grafting, budding, etc. In May, 18 meetings were held where demonstrations on the proper spraying of fruit trees were given. In July, 15 meetings were held, giving object lessons in thinning fruit, and general discussions on the care of orchards.

In the course of these meetings 27 Local Fruit Growers' Associations were formed, which we expect will become affiliated with our Association. Our membership has increased, and we justly pride ourselves on being the largest society of this kind on the continent, if not in the world. The work of the year will be fully brought out in the Secretary's Report; also the satisfactory statement that although a great amount of work has been done during the year, our finances are in good shape, with a balance of $241.56 on the right side of the ledger. I am sure all fruit growers will be gratified at the success of our Inspector, Mr. Fisher, in his persistent fight against that insiduous enemy, the San Jose Scale, and for the valuable assistance of the Department of Agriculture, which has enabled him to wage a vigorous war against the pest. And the success that has been attained goes to show that while we may not be able to entirely exterminate it, yet through the intelligent application of simple remedies, its ravages can be effectively checked, so that it will not be such an object of dread to fruit growers after all.

And now a few words as to the future. A vast amount of work yet remains for this Association to do. I had the pleasure of taking part in some of the orchard meetings, and I am strongly impressed with the need that exists for educational work in the best methods of orchard practice, more particularly in pruning and cultivation. It is surprising to see the sad havoc that has been wrought by itinerant pruners throughout the country. Had those people who have been injured in this way been members of our Association, or had access to our publications, this would not have occurred. One of the best articles I have seen on the pruning of fruit trees is that written by Mr. W. N. Hutt, of Southend, and published in Ontario Report of Farmers' Institutes for 1901. The article is well illustrated, and I would like to see it published in the form of a bulletin, and distributed among the members of Local Associations. The question of fertility should be strongly emphasized. Many of our orchards are suffering from want of proper food. We cannot produce good crops of fruit of high quality without a fertile soil, and I am satisfied that too little attention has been paid to this important subject by fruit growers. As I have already shown, this Association, from its very inception, has been doing educational work, and we have done a great deal. We have been very successful. We have made our Province famous as a fruit country, but we must not rest here. There is much yet to be done, and I trust the good work will be continued.

But there is also another phase of the business that demands our attention—the commercial. The questions of transportation and markets are important ones, and I trust that these vital matters will receive at your hands the careful consideration which their importance deserves.

I feel warranted in saying that there never was a brighter outlook for the fruit growers of Ontario than at present. A very gratifying feature is the ever-increasing consumption of fruit by our own people, thus furnishing a home market for a very large part of our products, particularly in view of the great influx of settlers to the vast prairies of the West, that part of our Dominion that is to provide homes for millions, and the vastness of which few of us seem to realize, but which will never be able, owing to climatic conditions, to successfully grow orchard fruits. It will be but a few years at the present rate of progress until that country will absorb all the surplus fruit our Province can produce.

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Then we still have the British market, and we maintain our pre-eminence there. Some are doubtful as to the advisability of planting more orchards. I don't think there should be any doubt on the matter. For my own part, I intend to keep on planting; and I often think of the good advice given by an old Scotchman to his son:—"Aye, be plantin' a tree, Jock; it'll be growin' when ye'r sleepin'."

Since our last meeting one of our Directors, Mr. W. A. Whitney, of Iroquois, has been called away. He was a man respected and loved by all of us with whom he has been associated, and we sincerely mourn his loss. And we are reminded that there are many faces missing that formerly greeted us at our annual meetings. They are "crossing the river one by one," but they have not lived in vain, for in giving to others information gleaned from a ripe, practical experience, they have left behind them monuments more enduring than marble. And it may be said of them that "They rest from their labors, and their works do follow them."

You will notice by our programme that a new feature has been introduced, in the bringing together the experimenters from the Experimental Fruit Stations. Their reports will, no doubt, be both interesting and instructive. I trust we shall have a very successful meeting.

GREETINGS FROM THE WESTERN NEW YORK HORTICULTURAL SOCIETY.

Mr. John Hall, Secretary of the Western New York Horticultural Society, said that he wished to convey the fraternal greetings from the Society he represented to the members of the Ontario Fruit Growers' Association. His Association was the pioneer society of its kind in the United States. Among the names of those associated with its work are those of Downing, Barry, Vick, and J. J. Thomas. Speaking personally, Mr. Hall said that whenever he came to this side of the line and saw the flag, although he was a naturalized American citizen, that there was something in his breast that responded to its influence, and brought back thoughts of the Mother Country. Mr. Palmer had referred with regret to the fact that so much of the bone and sinew of this country went to help build up the United States. He was forced to conclude that the success of that country was due in a great measure to the stability of character of the people from England, Ireland, Scotland, and Canada who had settled there. There was one thing the horticulturists of his State were turning their attention to which he thought was worthy of imitation here, and that was the beautifying of school grounds. Mr. Hall concluded by extending to his Canadian friends a cordial invitation to attend the forthcoming convention of his Society.

ADDRESS.

By C. C. James, M.A., Deputy Minister of Agriculture.

There is something appropriate, it seems to me, in having the Ontario Fruit Growers' Convention in the Town of Walkerton. If my knowledge of your country is not astray, the settlement of this section of Bruce and the Ontario Fruit Growers' Association were begun about the same time. If anyone had said when settlers first came into this section to cut out homes for themselves in the woods—then so far remote from the front and the settled portion of the Province—that forty years hence a meeting of an asso-

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ciation which extends over the entire Province would be gathered here to discuss questions of fruit growing, he would have been set down as a very unwise prophet indeed. However, it proves one thing that is very important to us, and it is that, as time goes on and our country becomes more and more settled, we find the fruit area being very much extended. Sections that a few years ago were considered ill adapted to the growing of fruits are now producing first-class fruits. The trouble always is to find out the varieties that are specially adapted to these sections. It may be, therefore, that we have in this Province considerable areas which are not spoken of now as being adapted to fruit growing, but which in ten or twenty years from now will be found to be very productive. Perhaps some of us will be here to see whether that prophecy or suggestion will hold good or not.

What is the object of an Association of this kind ? I do not know whether you are accustomed to have Association meetings in this place or not—whether persons concerned in other lines of work have at any time met here in convention or not. If they have, or if you have been elsewhere at conventions, you will find that in one or two particulars this Association in its meetings differs very materially from them. In the first place, the doors are open for everybody to come in and attend, and I trust that the people of Walkerton and vicinity will take full advantage of this and not allow this convention to come and go without attending as many of the sessions as possible. In the next place you will find that there are no restrictions or pass words to prevent anyone and every one from coming in and associating. What I want to convey is that this is an association for the general good ; it is for no persons in particular ; it is for everybody, although, perhaps, we might say that it is intended in particular for persons concerned in the growing of fruit. The aim and object of the Association may be summed up in the word "Education." We have a great many modes of education in this Province, but this is the one great line along which the fruit growers are to receive their education. We have a large number of other associations which are allied to this Association : We have an association for the development of our live stock industries, for the development of the bee-keeping industry, the poultry industry ; and so we might name ten or a dozen of these, all working along similar lines—that is, all more or less educative in their nature. It seems to me, therefore, that for a few moments this evening I might talk to you about the possibilities—what there is ahead—what is being gained by education.

What is the result of the educational work of this Association, and of other similar organizations that are being used in various ways to help on the one great common industry which embodies them all—our great agricultural industry ? A few days ago an announcement was made in the papers that we were to have shortly a new transcontinental railroad, and in display figures were set across these articles, " One hundred millions of dollars." We read these figures, and, possibly, some said : " It will be a magnificent thing for this country to have that amount of money spent in Canada in the next five years ; it will be enough to make the country rich." It is certainly a very large item, but if the prosperity of the country has to depend on this, it would be very little indeed. If you take the agriculture of the Province of Ontario from its extreme east to its extreme west and put it all together—farms, buildings, live stock, and implements—to make up what we call our agriculture, it would amount not to one hundred millions, but to a little over ten times that sum. So that when we hold up this large amount which is to be spent on a railway and think of it as something of very great importance, let us not forget that we are engaged in an industry that has invested in it an amount not less than a thousand millions, or a billion of dollars.

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Now, education in connection with an industry that has an investment of this enormous amount must be of importance. In this business we have in Ontario about 175,000 shareholders. These produce annually from two hundred to two hundred and fifty millions of dollars' worth of produce. Here, then, we have an industry beside which all the other industries of the country sink into insignificance. Is it not, therefore, important that associations for the improvement of our fruit and live stock, for the education of our farmers along these lines—is it not of importance that such associations should receive as much encouragement as possible, and be allowed to do as much good as possible?

Let me put it in another light: We have in the Province nine million acres of land under crop. I am not going to speak solely about fruit growing to-night; because I think that in this section of the Province you are interested in all the aspects of agriculture, and possibly at this convention you will have a surfeit of talk on the subject of fruit growing. We have, as I said, nine million acres of land producing field crops. You know very well what we grow upon those fields. Would it be possible by improved methods—that is, by an improved educational system—to add a dollar a year to every one of those acres? If so, you will see that our Provincial income would be increased by nine millions of dollars. If we could add only one cent per bushel to the value of the grain that is produced, we should add annually a million and a half to the receipts of this Province. Sometimes people may say that it does not make very much difference whether you get that extra cent for your grain or not; or whether you have to pay that extra cent for transportation; or whether your crop is just a little bit less or not. Perhaps to each individual it may mean only a few dollars, but when you take it in the aggregate and make this improvement all over the Province, whether in the production of the crop or in the amount received per bushel, you will see that you can count it not by hundreds of thousands, but by millions of dollars. Here is something that will appeal to us as fruit growers: If we could take the apple trees of this Province and improve the product of each one by only fifteen cents (and you will notice that in all these calculations I am keeping them at a minimum), we should be adding a million dollars' worth of fruit to our Province. One dollar on the milk produced by every milch cow would add a million dollars to our revenue, and only a quarter of a cent per pound on every cheese would add three hundred thousand dollars. Suppose we could improve our fields so that each one would produce a little more; suppose we could improve the product of our animals, and so, working from the bottom up, we could add a very little indeed to the average production of this Province, you see we should improve our annual income by ten, fifteen or twenty millions of dollars. How is this to be done? It is summed up in Education—educating our farmers, dairymen, fruit growers, grain growers, live stock breeders—in educating them and helping them to improve their products; and in this work this Association is playing a very important part indeed.

The possibilities of this Dominion were hinted at by the previous speaker in connection with British Columbia. I do not suppose that we have yet begun to realize even a fractional part of the enormous possibilities of that Province. Then we turn to the great Northwest and then to Manitoba, and last, but not least, to our own Province. I said that forty or fifty years ago where we are now standing was considered the remote backwoods, and not many people were dreaming that there would be a very prosperous agricultural community—a community interested especially in the subject of fruit growing—established here. Thinking of what has happened right here within that time, what is likely to happen in that still more extensive backwoods

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country of our farther north ? We have beyond the main line of the C.P.R. one solid block of fifteen million acres of magnificent clay land. It is unoccupied, and to a large extent unexplored. It has an area larger than the whole present occupied portion of Ontario. We must not think that this will not be occupied. There is good reason for thinking that forty or fifty years from now there will be thickly settled districts in that section, just as we have here in Bruce, Simcoe, and Huron. This means that there is going to be an enormous production in the country to the north of us ; and the Northwest is also filling up at a rapid rate. In those countries we shall have a population to be numbered by the million, and this will have a very important bearing on the fruit industry of this part of the Province of Ontario, for the reason that whatever may be the possibilities of these countries so far as the growing of live stock and wheat is concerned, we have very serious doubts about their ever being reckoned fruit producing countries ; they will be great fruit consuming countries. The thousands pouring into these northern countries mean so many more consumers of our fruit, and it may be that the shipping of fruit to the Old Country will sink into insignificance in comparison with the market likely to be developed in that section.

I want to refer to one or two items to show how by education two or three of these industries have grown very rapidly indeed. Take our live stock industry. The bacon and ham industry in Ontario has grown from nine million dollars' worth in 1892 to sixteen million dollars' worth the year before last. It has steadily grown by leaps and bounds. There is a production which I suppose has been unequalled by any of our manufacturing industries. It has not come by hap-hazard. It has been carefully nurtured and worked out along educational lines. If there is one industry in the Province that has been based upon rational education, it is the pork and bacon industry. The farmers have received education along all lines. Wherever an opportunity has presented itself, men well qualified have gone out and taught the farmers, and the result has been the gradual and sure building up of this industry. Consequently, our exports have grown at a very rapid rate. In 1896 we exported forty-seven million pounds ; in 1897, sixty million ; seventy-seven million pounds the next year, one hundred and twelve the next, and then it jumped to one hundred and thirty-two million pounds. The result has been that large amounts of money have been brought into the country, and the country has been greatly benefited. Those sections that have given particular attention to this branch, and have been receiving this education, have been profiting by it exceedingly, so that whenever you go into a section where pork is being extensively grown you will find prosperity existing in that section.

We might refer to the good effects of educational campaign along other lines, but I want more particularly to refer to this Association. This Association has undertaken in the past, and is going to continue in the future, what may be called educational campaigns in connection with the fruit growing industry. I have no figures to prove what the extent of our fruit growing industry is, but it will amount to a very large sum indeed. Through this Association a campaign has been inaugurated, and is being spread over the Province, instructing farmers and fruit growers as to the best kinds of fruit to produce, the best methods of producing fruit, and of sending that fruit to market. I think you will admit that if this Association through any of its channels can do anything to encourage and improve the production of fruit, then the small amount of money spent in connection with it will certainly be very wisely spent indeed. Agricultural questions—and fruit growing, of course, is only one part of the agricultural question—are questions of

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very wide import: they concern everybody—people in the towns as well as in the country, so that when an agricultural meeting is called in your midst, I trust that the people of Walkerton will be found taking as much interest in it as the people from the surrounding country. We may put down three very important results as the outcome of improved agricultural methods—results of the campaign carried on in the right direction. In the first place, there is a more equitable distribution of wealth. Supposing an individual by his efforts is able to amass a hundred thousand dollars; that wealth is centered largely in himself. Now you will see what I want to bring out in contrast. The development of great industries in towns and cities has a tendency to centralize wealth in the hands of a few individuals. But agriculture is distributive; it takes a large number of persons to enjoy that wealth. Certainly the rewards of agriculture are not likely to be as great as in the case of our manufactures, but a prosperous agriculture means a more equitable distribution of wealth throughout the community. It is much more important to have a hundred men well-to-do than it is to have one man extra well-to-do. Then the next point is that more men are likely to be attached permanently to their homes and to their country. The prosperous farmer is tied down to his land. The man in the towns and cities who becomes wealthy is in nine cases out of ten likely to move. He will perhaps go to some centre where he has an opportunity of spending his money more rapidly; but the more prosperous you make an agricultural community, the more permanently you tie that community down to the soil. It is not from the country that revolutions proceed; it is not from the country that great social troubles emanate. Given a country with a hardy, prosperous, contented rural community, and you are not likely to have much trouble proceeding from that source. The more prosperous you make the agricultural community surrounding the towns, the more prosperous must that town become. A man in a town may amass a large fortune, and it may have very little effect upon the surrounding community; he may build a fine house and add a few laborers and servants to his domain, but the great community outside is not improved very much. But the money you send back through the dairy industry and the fruit industry to the five hundred homes surrounding the town—does it stay there? It begins at once to flow back into the town. It seems to me that again and again our towns have been very short-sighted. I have known places where the surrounding country has been entirely neglected, and the people in the town have given no thought to the prosperity of the people in the vicinity. Perhaps they have passed a large bonus to build up an industry that has afterwards moved away. To a large extent that prosperity is evanescent. If the same money had been used in developing the prosperity of the farming community around the town, there would have been built up something that would not move away, something that could not have been kept to itself; and you will always find that a prosperous agricultural community necessarily means a well-to-do town in its centre. I would like to say to you living in the town of Walkerton that you have as much interest in the prosperity of the country around you as have those who live there. It is important to you whether the farmers shall be prosperous—whether the fruit growers here are well-to-do or not; it is important to you how the dairy industry is going on; and when our towns take a rational interest in the rural communities around them, we shall set up an educational influence that will affect the whole community, and then both town and country will progress in unison.

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ADDRESS.

By Dr. James Mills, President Ontario Agricultural College, Guelph.

I am here to-night not because I have anything special to say to you as a Fruit Growers' Association, or even to the people of the Town of Walkerton, but because I wish to keep in touch with the fruit growers. I wish to become better acquainted with them, and to know what they require of us at Guelph. The only way we can do this is to attend their meetings, listen to their discussions and criticisms, and hear what they have to say. I bring greetings from the Agricultural College to this Association, and to the people of the town of Walkerton. I never had the pleasure of visiting this locality before. Hence, I am glad to have an opportunity of meeting such a large representation of the people of this town, especially the young men and young women, who are the hope of the country. We are all struggling in this country after we reach fifteen or sixteen to make a living as best we can. We have certain natural resources of soil, timber, and minerals, and certain conditions as to climate.. Most of us think we have a very good climate. We have also a given amount of capital, which we are anxious to increase. We use these natural resources and capital to produce wealth, and the great instrument in the production of wealth through the agency of resources and capital, is labor. We cannot improve much on our natural resources, and we cannot very quickly increase our capital; it is to some extent a fixed quantity. The only thing we can really improve is the labor,—the industrial qualities of our people—our men and women and our boys and girls as they grow up—with a view to make them more successful workers.

The problem of production in this country, and in every other, is really the problem of how to improve the industrial qualities of its people. I like a meeting of this character, because it is a contribution to what I call practical education—education that tends to make us more successful workers, more effective producers; that will tend to make us wealthier, and enable us to secure a larger share of the necessaries, comforts, and luxuries of life in exchange for our labor. I have been surprised at the record our people have made in the matter of fruit-growing. You have been engaged in several large international exhibitions. One, as you remember, was held at Chicago, and we certainly had little expectation that our Ontario, much as we prize it, would stand abreast of California, Michigan, New York, and other great States in the matter of fruit; but we happen to know that Ontario took a larger number of marks for fruit than any State in the great American Union. I do not think that this was due to any superiority in natural resources. Of course, it is admitted that the further north you can successfully raise anything, the better will be its quality. Our fruit is of excellent quality, and that no doubt added a good deal to the number of marks gained at Chicago. But, after all, I do not think our resources are in any way superior to those of New York, Michigan, Ohio, and other fine States in the northern and western part of the Republic. Why is it that we stood first at Chicago and second at the Pan-American? I think it is due to the high standard of industrial qualities to which our people have attained. They have a large foreign population across the line, which has hardly been assimilated yet, while we have in this Province a combination of English, Irish, and Scotch, and a little German, which has produced a very high type of workers among us; and when it comes to an international competition, our men tell every time. The one that counts is the men. If you can raise a higher type of men, you will make a higher

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record every time. I am glad to see meetings of this kind, that contribute towards practical education—towards the raising of the people to a higher level as workers ; and our education is beginning to point in that direction, even in the public and high schools. They were hard to move, but they have come to it at last, and all are aiming to give our education more of a practical bearing, so as to make our people better producers, that they may get a larger share of the necessaries, comforts, and luxuries of life for their labor. I think the result will be that we shall get as much of general education as we have had, and at the same time more of the practical.

This Province has already spent a considerable sum in the development of the fruit industry, and a great deal of valuable work has been done. A good deal has been done by this Association—by such meetings as this, by the press reports thereof, by the publication and distribution of your annual report, by the publication of the "Horticulturist," and by holding meetings here and there at various centres to discuss questions pertaining to fruit growing and floriculture. I am inclined to think, however, that they have not yet done so much as they ought in the matter of vegetable gardening. I have not yet heard anything worth listening to on that line. I think it is important that our people should be taught to raise the best quality and the largest quantity of vegetables in the gardens of the country ; and, in my judgment, it would be well if this Association would give the matter a little more attention.

I think that even better work is going to be done under the plan of holding orchard demonstrations in the spring in spraying and pruning and how to care for orchards generally. I would say, go ahead on this line, as I think there is a wide field for very valuable work in this direction.

I am a member of a Board, a very modest Board, that has not said much about what it is doing. I mean the Board which controls the Fruit Experiment Stations of Ontario. We have in this Province what many people regard as the simplest, cheapest, and most effective plan for fruit experimentation that has been devised by this or any other country. We have a Board of five men. The President of the O.A.C. is Chairman, with no pay for his services; the Horticulturist of the O.A.C. is a member of the Board, with a reasonable allowance for visiting stations and reporting on them; and the Fruit Growers' Association contributes three of its most progressive, wide-awake members, whose remuneration consists of their travelling expenses and a per diem allowance for the time spent. What do we do ? We test varieties of fruit, to see what kinds are of value to the people, and to determine which are best adapted to the different localities and different soils. How do we do this? By buying land and supporting experiment stations, and erecting buildings and equipment would have been one way ; but that would have cost a great deal of money. Instead of that, someone wisely suggested another line of action, and said to the Board, "Select in different parts of the Province some well-established fruit growers, who have good orchards already bearing —one in the southwest, with peaches as a specialty, one in the Grimsby region for grapes, one in the Burlington district for small fruits, one somewhere else for apples, and so on through all sections of the Province." We, therefore selected men who already had orchards, and were known to be good workers. We said to them : "We want you to report at once on the trees you now have in your orchards, and take such varieties as we send you and report on them ; and we will give you a small sum per year for your labor." You will see that in this way we got reports on all varieties of fruit that were already growing in different parts of the Province without waiting to

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grow trees. We had not to buy the land, and spend money in buildings and large salaries; we utilized what we had, and got valuable results from the beginning.

The second part of our work is to prepare a list of all the fruits grown in the Province, giving a photograph, with a concise, accurate, and thoroughly reliable description of each—such a description as will serve growers and others in coming to a conclusion as to the value and suitability of fruits for different localities. We are using our Secretary to prepare a description of all the fruits grown in the Province. Instalments of that report are being published from year to year. The whole expense for service and all the rest of it has never exceeded $2,600 per year, and we are doing as much work in the way of testing varieties as though we had spent a large sum for land, buildings, and equipment, and were paying $5,000 a year for management.

But there is still a great deal to do in this Province for the advancement of the fruit industry. I want to ask you two or three questions: What about the neglected orchards of this Province—orchards run to grass and weeds? I have travelled through some of the best fruit sections within the last two months, and I confess I have been ashamed for my Province to see orchards running to grass and weeds up to my waist. I have seen this in one of the most public places of this Province—along the Niagara River—to the utter disgrace of the Province; orchards with dead trees standing in them; trees with dead limbs on them—an eyesore; orchards with piles of brush lying among the trees for months or years—I suppose to manure the soil—(laughter)—to the disgrace of the owner and the men of the neighborhood in which he lives. I wish this Association would send a committee through the Province or do something else to reach the men of whom I speak, and make them tidy up their orchards for the credit of the Province, if not for their own benefit. I think the women should deal with their husbands and their boys, and give them no rest until they put their orchards into good shape. If I had an orchard such as I speak of, I would work night and day till the dead trees and dead limbs were removed. There is a good deal yet to be done through the direct agency of the Association, or of the Farmers' Institute, or in some other way to reaching men who are neglecting their orchards all over the Province.

This season has convinced me that the fruit growers are not spraying so much as they ought. A great deal of the fruit this year is badly spotted. It is not all spotted by any means. I could point to some orchards that had just as much rain as all the rest to wash off the spraying mixture, but the trees were sprayed in such a way that the apples were clean and nice. Four-fifths of the snow apples are unfit to put on the table, just because the trees were not sprayed properly. Four out of five men who spray do not half do it. You need to spray from all sides, so as to reach the utmost tip of the farthest limb, or you will not kill the insects or the fungi that you ought to reach. There is a great future for this industry if you will go to work. Take your coats off and cut out the brush. Some people are always asking us how to kill one kind of weed or another, and how to kill this insect and the other. There is just one way to get rid of them—take off your coat and go to work; that is it. You say, "Labor is scarce." Yes, it is, and most of it is not worth much when you get it; but that will not let you out at all, because you have as good a chance for labor as many of your neighbors who have nice orchards. Many men, young and old, spend as much time kicking their heels together in hotels and blacksmith shops as would remedy these things.

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I have just read the report of a delegation of fruit men sent out by the Fruit Association of the city of Liverpool. They say that the best fruit belt on the continent of America is on the north side of Lake Erie and Lake Ontario, and not only on the continent of America, but in the world, taking the quality and variety of fruit it produces into consideration.

The President: We are trying to remedy this sort of thing. We have been an educative institution from the time of our inception in 1859, and I think we are making progress. I venture to say that the Province could not have made the showing it did at the great Fairs had it not been for the Fruit Growers' Association.

ADDRESS.

By R. M. Palmer, Freight Rate Commissioner for British Columbia.

I have looked forward for some years to attending a meeting of this Association in order to get some pointers that would be of use in British Columbia. We have a good many settlers from Ontario in that Province, and since the inception of Institute work there we have drawn upon the talent of Ontario for our speakers. Commercial fruit growing in British Columbia is not developed along the line you have been following here, but is patterned more upon the system carried on in California, Oregon, and Washington. I must confess that in commercial fruit growing the Californian leads the world. If I might give this Association a hint, it would be that in developing the commercial interests of fruit growing in Ontario it would be worth while to pay more attention to the methods that have been successful in California and other Pacific Coast States.

But I must confess to having also an ulterior motive in coming here. For many years we in British Columbia have heard that the young bone and sinew of Ontario and other parts of Eastern Canada finds its way to the United States and to Manitoba and the Northwest Territories. Not only do you lose a great many people to the United States, but also those people who have gone to Manitoba and have prospered there, when they want a change of climate, invariably turn their attention to the other extreme and want to go to California. We in British Columbia have a climate that is in many respects better than that of California, and we want more of the bone and sinew to which I have referred in order to develop our Province; if you must lose these young men, we want our proportion of them in British Columbia.

British Columbia has been likened to a sea of mountains; but between those mountains we have valleys—broad stretches of fertile land, some of which are being made use of as pasture land. But the time is coming when these lands will be irrigated on a large scale, and then they will be valuable for fruit growing purposes. We shall then have a large development of the fruit growing industry.

Now, I do not wish to make any inviduous comparisons, but merely to give the facts. I am surprised to learn of the low prices you are receiving this year for your fruit. There must be some reason for this. I hear, for instance, that transportation rates are high, and that commission charges are high, but it is borne in upon my mind that if you really want to realize the profits that rightly belong to you, there is a good deal of work to be done among your people themselves. For the last two years I have been identified with the question of freight on farm products in our Province. We found

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that the railway people had their views on the subject, and that the fruit growers and farmers had theirs, and each one blamed the other. After going very carefully into the matter we succeeded in getting from the C. P. R. concessions in rates and in the handling of our products that were of great value indeed. At the same time I am bound to confess that the greatest fault has lain with our own people. When you come to consider this question closely, I think every reasonable man will admit that the interests of a railway corporation and those of the community it serves are very closely bound up together. Where you have a prosperous community, you must have a prosperous transportation company serving that community; so that the two interests are identical. This is the basis on which I would suggest you go to work in this Province. I think that one of the reasons that prices are low in Ontario is that there is something wrong with your system of selling, and that either the fruit is not of so good a quality as it should be, or else it is not properly packed. We have had the same difficulty to contend with in our coast district. On the other hand, in the Okanagan district, where our true commercial orchards are, we do not experience that difficulty, because careful attention has been given to packing and grading, and the methods employed in California have been lived up to. We find that buyers are most anxious to get fruit in that district. At the present time arrangements are being made with buyers as far east as Winnipeg for the whole of the product of that district. In our coast sections we have not yet such a desirable state of affairs. We have greater difficulties of surroundings there, and therefore I can sympathize with you in the troubles you encounter here.

There is a very prevalent impression that, while we can grow large fruit in British Columbia, the quality is not good. This is not the case, however, and I believe the idea has got abroad through the fault of our own people, who, in their efforts to advertise British Columbia, have sent out only the very largest specimens. I do not need to tell you, as practical fruit growers, that with overgrown specimens you invariably have size at the expense of quality. I should also explain that our climate varies very much, being much more humid along the valley of the Fraser, and on the coast generally, than it is in the Okanagan and the valleys of the interior. The quality of the fruit varies correspondingly. Now I wish to say that the fruit I have with me from British Columbia is not only good to look at, but is good to eat, too.

In the early history of fruit growing in our Province almost any kind of package was used for sending fruit to market, and with disastrous results. I remember inspecting a lot of fruit three or four years ago where such was the case. One package, for example, had been repaired with part of a coal oil case, and the lettering on it said that it was "warranted not to explode." But things move pretty fast in the West, and such packing is now altogether a thing of the past. We have gradually got the business into such shape that now all through the country the packages are uniform. We also had trouble in the grading of our fruit. I am sorry to see that you are having the same trouble here. We have to some extent overcome this difficulty. It has got to be that certain brands of fruit upon our markets are a sufficient guarantee of excellence, and there is no necessity to open the package. I am quite sure this will be the case here when the growers adopt this system of packing. We use nothing but the box for packing, and find it has many advantages. Besides, it is handier for the housewife, who is able to use a box of apples before the fruit begins to spoil. Nothing increases consumption so much as to place only choice fruit

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upon the market. If you want to encourage the consumption of fruit not only in our own district, but in the outside districts, send nothing to market but the very best of its kind. Make some other use of everything that is not up to standard—evaporate it or turn it into cider or vinegar, or feed it to the hogs, but do not put it on the market.

My main object in coming here is to give information, and also to gain settlers for British Columbia, and it would therefore be unfair for me to take up much of your time this evening.

INSECTS INJURIOUS TO FRUIT.

By Dr. James Fletcher, Central Experimental Farm, Ottawa.

The subject of the control of insect pests in garden and orchard is an exceedingly simple one to those who have studied it. Almost every fruit grower to-day knows that it is necessary to treat his trees and plants for the destruction of insect and fungous pests, and that there are remedies which may be sprayed on the trees, and that these remedies have a sort of mystical effect on their crops; but the general conception of spraying is the turning on of some liquid with a fire hose. Spraying, as a rule, is not well understood by the people of Canada, to whom it is of the greatest concern. Its correct definition would be an operation by which some liquid is placed upon the plant in a spray, or in a vapor, which settles upon the plant, all the little molecules of the liquid being separated from each other. If the spraying is done properly, the nozzle is moved from that part of the plant treated as soon as it is covered. It may be done too densely to be thorough, in which case you merely wash off what you have put on. A great deal of the spraying is not done well through lack of observation and care in choosing the implements with which it is to be performed. The nozzle is of more importance than the pump.

The object of spraying is to prevent loss to the crop. There is no advantage in pruning, planting and cultivating well if the fruit grower does not also know how to protect his crop. Yet the futile question is always being asked, "Does spraying pay?" Does anything pay? Where it has been done with care there is no doubt about it. Then people frequently raise objections like this: I sprayed my trees; yet I have the codling moth. What did you spray with? Bordeaux mixture. Nothing to do with codling moth; but if you use Paris green and Bordeaux mixture you should expect results. Bordeaux mixture is a fungicide; Paris green is an insecticide, that is to say, it is an arsenical poison to destroy insects that eat our fruit. Fortunately for our fruit growers, we can combine these two operations.

I firmly believe that one of the best things for the fruit interests of Canada was the introduction of the San Jose Scale, as it is bound to emphasize the necessity for thorough work in studying and treating insect pests generally. There is better work going on here in regard to that insect than at any other point in the world. The Ontario Department of Agriculture, through its inspector, has achieved better results in this connection than the scientific entomologists and horticulturists of the United States. To-day we are in a position to say that we have a remedy that the orchardist can apply, and can, if he will, protect his trees from this pest.

There are about one hundred injurious insects that annually affect our crops in Canada, and a remedy has been found for 98 per cent. of them. But you cannot do the work without knowing how, and to know how

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you must study the habits of the insects. I am thankful I have lived to see the day when some knowledge of natural things is a part of the proper equipment of every boy and girl.

It is also most important that you should have the best materials and the best implements if you want your success to be the best success. The difference between good and bad and the best and the worst, is often merely a matter of a few cents. Never buy a thing merely because it is cheap, as the cheapest often turns out to be by far the dearest. This statement applies with special force to the purchase of seed. Between the best clover seed, for example, and that which is exceedingly bad, the difference in price is but a few cents per pound. Eight cents will pay for poor seed, and twelve cents will pay for good seed. This is a narrow margin, but by planting the poor seed you may bring into your place weeds that may cause damage to the extent of hundreds of dollars.

I find that the oyster-shell bark louse has become very prevalent in our orchards, and is now one of the most injurious insects that we have to fight. The first step taken is not to kill the insect, but to invigorate the tree on which it is found. This is done by proper cultivation and fertilizing. You may then turn to the insect and give it the treatment recommended for it. It is not necessary for me to go into the details of the treatment of this and other pests. A postcard sent either to the Ontario or the Dominion Department of Agriculture will at any time result in having sent to your address bulletins that contain full and accurate information upon these points.

APPLE GROWING IN WESTERN NEW YORK.

By Prof. John Craig, Cornell University, Ithaca, N.Y.

This lecture was intended to emphasize the importance of cover crops and spraying, and was illustrated with lantern slides. One of the views showed the effect of fall rains on orchards that had been kept in cultivation all season and left bare in the fall. The land in this case, having considerable fall to it, was seamed in every direction, and the best of the surface soil washed out. Other views showed in contrast the surface of the orchard well protected with cover crops of clover, buckwheat, vetch, or rape, sown in the middle of July. Not only was the soil prevented from washing by this means, but the roots of the trees were protected against winter frosts, by the subsequent rotting of the growth, a large addition was made to the humus of the soil.

Other illustrations showed how the roots of clover penetrated deep into the soil, and the effect this penetration must have in bringing up nutriment from below, and in breaking up the subsoil.

In speaking of clover crops, Mr. Craig placed the hairy vetch first. Vetch planted early in June caused an addition by the 1st November of 256.1 pounds of nitrogen to every acre on which it was planted. Cow peas gave 52.6 pounds. If you value nitrogen in the form of a commercial fertilizer at 15 cents per pound, it is quite evident that you get your fertilizing material at a very low price when you sow vetch to plow under.

The illustrations dealing with spraying were particularly effective, and showed the great improvements made by the orchardists of New York State in this particular. In some cases gasoline engines were used for operating the pumps. The gasoline engine, said Prof. Craig, when perfected, will prove the ideal system, as it is easily started and readily managed.

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Orchardists in New York give their trees lots of room, and make money by doing so. One apple grower in that State had an orchard of Baldwins in which the trees were planted 40 x 40 feet apart. When full grown they were thinned to 60 feet. On this orchard 48,000 gallons of Bordeaux mixture were used, and the crop was sold for $15,000. Out of 10,000 barrels gathered, not over 100 barrels were culls.

SPECIAL METHODS OF CULTIVATION FOR SPECIAL CONDITIONS.

By W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

It is not very many years ago since most Ontario fruit growers were farmers as well. Gradually, however, it was found that on account of injurious insects and fungous diseases, in order to make a success of both farming and fruit growing, it was necessary to either let the orchards look pretty much after themselves and take what was found in them in the autumn, or to pay less attention to the farm and more to the orchard. The result has been that the older farmers have, I believe, been neglecting their old orchards as a rule, and not planting any more trees; while a large number of the younger men who believed that a good living could be made out of fruit growing alone, have left general farming and are devoting their whole attention to fruit growing. As soon as fruit growing became a special industry it received more attention, and men have devoted their lives to the solution of problems relating to the soil, moisture, plant growth, and kindred subjects, and as a result various systems of orcharding and small fruit culture were tried, and those recommended which were thought to be the best. Up to the present, however, I think that the advice given to fruit growers has been, as a rule, too general, and that in the future more attention should be given to the special conditions which prevail in different districts. In an article in the November number of the "Canadian Horitculturist," called "Contrasts in Methods of Apple Culture," I gave my views on this subject of special culture of apples for special conditions, and should like to repeat them here.

During the early part of September the writer had the opportunity of visiting the Hamilton and Grimsby districts, and of inspecting some of the large apple orchards there, and almost immediately afterwards of travelling more than 350 miles east to Montreal and vicinity, and examining large orchards there also. The contrast in methods was very marked, yet as good fruit was seen at one place as at the other. In the West, clean culture, heavy pruning, and thorough spraying resulted in good fruit. In the East, there was good fruit where the orchard was in sod, the trees lightly pruned, but thoroughly sprayed. Spraying with Bordeaux mixture is necessary everywhere, but methods of pruning and soil culture must be governed by climate. In the West the soil is cultivated principally to conserve moisture. In the East, especially in the Ottawa Valley, this is not usually necessary, as there is sufficient moisture to ensure a thrifty growth and well-developed fruit. In the West, severe pruning invigorates the tree, the result being larger fruit. In the East, there is danger of sun scald from severe pruning, though light pruning is necessary.

In Eastern Ontario and the Province of Quebec protection for the roots in winter is, in the writer's opinion, necessary, and as a rule more important than conservation of moisture. A young, bearing orchard may be ruined by winter-killing if the roots are not protected by grass, sod, or some clover crop. There is no better system of cultivation known for Western Ontario than

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clean culture in spring and early summer, followed by a cover crop for winter protection, and for adding humus to the soil. It is doubtful, however, if this system should be recommended without restrictions for all sections. The writer believes that after the young trees are established good results will be obtained, where the trees do not suffer from drouth and where the soil is good, by keeping the orchard in grass or clover all the year round, and mulching the ground with the grass or clover, which should be cut several times during the season. The soil may be top-dressed with manure of other fertilizers as often as is found necessary to maintain its fertility. There is much more likely to be immature wood where the clean culture and cover crop system is adopted than where the trees are in sod, and well ripened wood is very essential in Eastern Ontario and the Province of Quebec.

In the American agricultural and horticultural periodicals there has been much discussion for a year or more over the splendid results obtained by Mr. Grant Hitchings, Onondaga, N.Y., in growing his apple trees in sod and mulching with the cut grass. The fine results obtained by this gentleman has fully justified the discussion on his methods, but it is unfortunate that more prominence has not been given to the special conditions of soil moisture which are said to exist at his place, making apparently an unfair comparison with the general conditions in that part of New York State, which, I believe, are such as require clean culture, to conserve moisture. Mr. Hitchings' results, however, prove that where there is abundant moisture, as in many parts of Eastern Ontario and Quebec, his method may be adopted with good success. At the Central Experimental Farm it has been found that growing clover in the orchards and mulching with it has resulted in a thrifty growth and better fruit, and the writer has seen many orchards in sod producing fine fruit. Every orchardist must, however, study his own conditions, especially those of moisture and soil.

Another fruit which requires special culture for special conditions is the grape. An entirely different system of cultivation is required in Eastern Ontario from that in West and Southwestern Ontario. In the West no protection for the vines is necessary. In the East, unless the vines are laid down and covered with soil, no crop need be expected. On account of this necessary protection, a different system of pruning has to be adopted in order that the vines may be laid down and covered with the least expense. It has been found that the most satisfactory method is a modification of what is known as the High Renewal. In the system we have adopted the vines have two arms which are trained in opposite directions. These arms spring from a stub near the ground, and not more than 18 inches from it. The arms are removed, and new ones left as soon as enough buds are killed or die to leave them unprofitable. If the buds all live, the arms are renewed before they get stiff, as when they are pliant they are much more readily covered. A description of this system may be found in the report of the Central Experimental Farm for 1901. As many as 115 varieties of grapes have ripened at Ottawa in one season, but not this year.

Strawberries can be grown as successfully at Ottawa as in any place in Canada, though the successful wintering of them is uncertain unless protection is given. All that is necessary, however, is a light covering of straw, which prevents much of the alternating thawing and freezing of the soil in winter and early spring, and retards the growth of the plants in spring, so that the blossoms are more likely to escape spring frosts.

Abundant evidence was afforded last spring of the value of this special method for the special conditions we have in the East. The growers in the vicinity of Ottawa who did not cover last winter had very little fruit owing to May frosts, which destroyed the pistils of the flowers. Others uncovered early and suffered as badly. At the Farm we did not uncover, as usual, un-

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til there was danger of the plants heating. As a result, only a few of the earliest blooming varieties were injured. There is a great temptation to uncover early, and even not to cover at all, as the fruit ripens earlier, but as the best prices are obtained for our mid-season and late berries this is not necessary. These are some examples of what is meant by special culture for special conditions.

The question, however, to be solved is : Where or under what conditions is one system good and another bad ? The fruit grower may and can get useful information from the Experimental Farms at Guelph and Ottawa, and from the Fruit Experiment Stations, but although the work done at these places is well done and in the right direction, every individual must solve these questions for himself, and he who studies his special conditions well and understands them best and puts into practice the knowledge which he thus gains will, all other things being equal, make the most successful man. As an example of the results of following special methods of culture for special conditions, let me give you an account of a close-planted orchard of Wealthy apple trees at the Central Experimental Farm :

A Close-planted Wealthy Apple Orchard.

In the spring of 1896 there were in the Farm nursery 144 five-year-old Wealthy apple trees which had been used in an experiment. As there was a piece of land available that spring, they were planted out 10 by 10 feet apart, the object being to carry on further experiments with them. Eight of these trees have died, but most of the rest are making thrifty growth, though some of the trees are affected with canker and sunscald. The soil has been kept thoroughly cultivated during the growing season every year since. During the past four years this little orchard has given very good returns, considering the size of the trees, and it promises to be still more profitable. It is doubtful if the trees will need much thinning, as a few of them die every year, letting the light and air into the rest. The soil is a cold, light, sandy loam, and from 1896 up to the autumn of 1901 the only fertilizers applied were 284 pounds of superphosphate, 54 pounds of muriate of potash, and 132 pounds of sulphate of ammonia, the estimated value of which was $6.64.

In the following tables will be found the receipts and expenses for the past four years :

			Per acre.
1899..	Picked 189 gallons ; sold at 10c. gal	$ 18 90	$ 59 15
1900..	" 455 " " 10c. gal	45 50	142 39
1901..	" 156 " " 15c. gal	23 40	73 23
1902..	" 982 " " at 25⅞c. (Glasgow)	85 41	356 88
	530 " second grade sold at Ottawa at 6 9/10c.	32 55	
1899..	Windfalls, 66 gallons ; sold at 5c. gal	3 30	10 38
1900..	" 148 " " 5c. gal	7 15	22 38
1901..	" 224 " " 5c. gal	11 20	35 05
1902..	" 932½ " " 8 3/11c. gal	79 60	240 79
		$307 01	$940 15

EXPENSES.

1899-1901.. Estimated expenses per acre for three years, including rent of land, fertilizers, cultivating, spraying, and marketing	$148 80
1902.. 45 tons per acre barnyard manure 50 cents per ton	22 50
Rent of land per acre	3 00
Cultivating and spraying per acre	14 43
Baskets and boxes	120 12
Picking, packing and marketing	145 77
Total expenses	$454 62
Total receipts per acre for four years	$940 15
Total expenses per acre for four years	454 62
Net receipts	$485 53
Average profits per acre per year	$121 38

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There were 512 1-2 gallons of small apples which were not sold, of which 119 gallons were among the picked fruit and 393 1-2 gallons among the windfalls.

The reason that there is such a large proportion of windfalls is that the Wealthy apple drops badly, and this was especially the case this year. The windfalls, however, which were sold brought a better price than the second-grade picked apples, and as good prices as picked fruit from other Wealthy trees. There is a great advantage in having a good local market, as the windfalls can be disposed of before they decay. The expenses are all estimated on a very liberal basis. The greatest yield of picked fruit from one tree in 1902 was 16 1-2 gallons, and the greatest yield of windfalls and picked fruit was 34 gallons from the same tree.

It has not been possible to obtain the exact cost of this orchard prior to 1899, but, including rent of land, cost of trees, planting and cultivating, the expenses per acre would be about $150.

When such good returns can be had in a short time from Wealthy apple trees planted 10 feet apart, it is worthy of consideration. Is it not possible that it would be a good practice to have blocks of such early bearing trees of different ages and keep rooting out the older ones when they begin to fail? The development of this little orchard of Wealthy apple trees will be watched with much interest.

THE STUDY OF THE DEVELOPMENT AND GROWTH OF FRUITING BRANCHES OF OUR COMMON FRUITS.

By Prof. H. L. Hutt, Agricultural College, Guelph.

The speaker produced an apple, and said: This may be termed the finished product towards which the orchardist is aiming. It will be interesting to trace the development of this fruit, starting with the growing of the seed, through the various stages of growth, until the finished product is obtained. If we were to plant one of the seeds of this apple in the ground, under the influence of the sunshine and the moisture of the soil, it would germinate and send a root down into the ground and a stem into the air. The stem would develop leaves in a short time, and we then have all the parts that a tree requires for growth—the root, the stem, and the leaves. The first year the tree will not grow more than eight or ten inches. The following year it will grow from two to three feet high. If we want that tree to produce exactly the same kind of apple as the one from which we took the seed, the nurseryman has to take it in hand, and he secures a bud or graft from the parent tree and inserts it into the seedling.

The young tree grows in two ways—in height and diameter. It will be interesting to note a little more carefully how growth takes place. How does a tree increase in diameter? To begin with, we have in the ground a root system, from the large main roots to the rootlets and root hairs. These extend as far below as the branches extend above ground. These roots take in the moisture from the soil, containing plant food in solution. This food passes up the roots and through the sap-wood or outer wood of the trunk and branches until it reaches the leaves. The leaves are contrived for spreading out the sap over a wide area, where it is exposed to the action of sunlight. In the leaves a number of changes take place in the sap. Much of the moisture is given off through the leaf pores, and much of the sugar in the sap is converted into starchy matter, and thus becomes ready to enter into the growth

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of the tree. After the sap has been thus changed in the leaf, it passes down again through the twigs and branches and trunk until it reaches the roots. In its downward course it passes just underneath the young bark, forming what is known as the cambium layer. This cambium layer, by hardening or drying, forms a new layer of wood on the inside and a new layer of bark on the outside. So that over the whole tree we have a new layer added each year. It is thus that the rings or circles are formed that you see in the cross-section of a branch or trunk of a tree, and by counting them you may find out the age of the branch or tree. That is how the tree increases in thickness. Now for the growth in height. The same flow of sap which goes into the leaves increases the growth at the extremities of the branches, but none of the parts below the top bud increase in length at all. We sometimes hear the question asked, Does a tree trunk (that is, the part below the branches) lengthen? If the growth takes place at the extremities only, how can the trunk lengthen? But in the forest we see trees that have trunks forty or fifty feet high. How do they get to be that height if the trunks do not stretch out? The explanation is that the lower branches have fallen away, and the new growth each year in the diameter of the tree has gradually buried the stubs and knots till they are completely out of sight, and nothing but a smooth surface is presented. But when the lumberman takes the tree and saws it through the centre, you find the knots showing where the branhces have been.

Then, too, people cannot understand why the growth takes place from the downward flow of the sap rather than from the upward flow. How, they ask, does it come about that the bottom of the tree is the larger. We must look on a tree or branch as a stream, where the branches are the tributaries. The more branches, the more material is being sent down to aid in the growth below, so that the part below is necessarily thicker than the part above.

There are two ways we can learn the age of a tree or branch. If we start at the end of the branch and count backwards, we shall see that at the base of every year's growth there is a ring in the bark. If we count these we get the age of that branch. We can also determine the age, as I have said, by cutting the branch in two and counting the number of rings shown in the cross section.

When the tree comes into bearing, it is intersting to study its buds. Before that time all the buds are leaf buds, and every perfect leaf bud is capable of producing a branch. That is one of the most important things to remember. They do not all do so; but the terminal bud does, and in that way the growth of the branch is extended. Those most likely to produce branches are the ones near the top. Near the base of the year's growth you will find a lot of inactive buds that have been covered more or less by the flow of cambium. Although every bud does not naturally produce a branch, every one can be made to do so by cutting off all the branch above it, and thus giving it a prominent position. It then becomes a terminal bud.

As the trees come into bearing the fruit buds appear. Fruit buds are specialized buds developed primarily from leaf buds. It is one of the strange facts that a leaf bud may produce a branch, or may remain dormant and produce nothing, or it may develop into a fruit bud and produce fruit. This transformation is one of those mysterious changes that goes on so smoothly and imperceptibly that we cannot see it; we see only the result of it. If we study the question closely we may discern some of the conditions that bring about this transformation. The tree has got to reach a certain stage of maturity before this transformation can take place. A tree of poor soil will

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often come into bearing earlier than one on rich soil. If a tree is checked in its growth, it tends to bring about an earlier transformation of the leaf bud into the fruit bud. For example, the Bartlett pear, grown as a standard tree, will be five or six years coming into bearing, but by grafting it on the quince and thus dwarfing it, it will come into bearing in half that time.

How are we to distinguish the leaf bud from the fruit bud? This may be done by observing the different characteristics. In the cherry, for example, the leaf buds are all sharp pointed, while the fruit bud is much rounder and plumper. The fruit buds, also, begin to swell much earlier in the season, and start into growth more rapidly.

Fruit buds vary also in the way they produce blossom; some are simple and others are compound buds. The peach or apricot produces just a single flower, but in the cherry, plum, apple, and pear, each bud produces several blossoms—the plum two or three, the cherry three or four, and the apple and pear six or eight.

As the young tree comes into bearing, it develops peculiar branches, or forms of branches, on which the fruit is borne. In the case of the apple and pear, while the tree is young, the fruit is usually produced at the ends of the more vigorous shoots, or at the ends of the branches; but as the tree matures you will find that other forms of fruit branches are developed. The more important fruit branches on the apple and pear tree are usually known as the fruit spurs. These are short, stunted branches.

Take a branch, starting at the bottom, see if you cannot read its history. All the way back you will find scars showing where it has blossomed or has produced fruit. In the apple and pear the fruit is borne at the extremity of the spur, and growth at the extremity is checked in consequence. The next year a bud just below the extremity produces a short shoot, so that you will find the growth of the fruit spur going zig-zag. In the plum and cherry we have a different kind of fruit spur. Here the blossoms are in a cluster at the end of the spur, and just in the centre of the cluster we will find a leaf bud, which is to extend the growth of the branch; so that instead of the branch zig-zagging, it grows straight ahead, and you get a straighter spur.

In the peach we have a still different growth. Here there is no fruit spur, strictly speaking. We sometimes find the fruit produced at the end of a little shoot, but it is not a spur. The fruiting wood of the peach is the wood of last season's growth. It is important for the fruit grower to know where to look for the fruit bud in the peach, so that in pruning he may not cut away too much of the bearing part of the branch.

In the grape the fruit is produced on the same season's growth, and the first three joints of that wood will produce the bunches of fruit. Some fruit growers think that if only those three joints produce fruit, there is no use in the rest of the wood beyond that. They forget that the vine is sending sap away to the end of the cane, and that every leaf beyond the grapes is sending back its supply of material to the grapes, so that the more wood you have beyond the bunches the better the growth of the fruit. In pruning the grape we should leave thirty or forty buds of this year's growth from which shoots may be sent out the following spring. If this is done large grapes will be produced. The raspberry is somewhat similar, the fruit being produced from the wood of this season's growth.

In the quince the fruit is produced at the extremities of shoots of the same season's growth. In the currant and gooseberry we have little fruit spurs, something like in the plum, and the fruit is produced from wood of the second and third year's growth.

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This is an important subject for the fruit grower. If they would take a branch of their tree and read what nature has written, they would have a much more intelligent idea of how fruit is produced. I have heard fruit growers say: "I have given my trees a heavy pruning this year, and we are going to have a good crop." They forget that the fruit is not produced in one season; it is not what we do this year that gives us the crop of next year—it is the accumulation of the work of years. It is necessary by proper management to get a good growth of fruit spurs from year to year.

FUNGOUS DISEASES AND INSECT PESTS OF 1902.

By Professor Wm. Lochhead, Ontario Agricultural College, Guelph.

Chief among the apple diseases of the present season has been the Scab. I think that the fruit growers are coming to understand this disease, and to treat it properly. It should be borne in mind, however, that the scab has not only summer spores, which are spread by the wind, but winter spores, that winter over in the dead fruit and leaves, and that, in the following spring, come out and reinfest the young leaves. Cleanliness is, therefore, of the greatest importance at this stage; it is just as important as spraying is at the first of the season. In the treatment of Scab, I would advise you to spray thoroughly, and early in the season, just when the buds begin to swell. Early treatment is an important factor in the control of this fungous disease—as early as you can get on the ground. In the case of Curl Leaf of peach you should begin spraying one or two weeks before the flower buds open.

Bordeaux mixture and Paris green or arsenic is the most reliable mixture for spraying. The reason why I recommend the use of a poison along with the Bordeaux mixture, which is a fungicide, is to catch the Bud-Worms and the Case-Bearers, which are becoming very numerous, and which are probably doing more injury in many respects than the Codling Moth. They begin work early; they have great appetites, and they eat the young buds, which are ruined before you are aware of it. The proper time to treat them is when the buds are beginning to unfold. For Codling Moth you should spray immediately after the blossoms have fallen. You should spray again two or three times during the season, both for Scab and Codling Moth.

Another pest to which I desire to call attention is the Woolly Aphis. Alarming reports regarding this insect are coming from many parts of the Province. Woolly Aphids are sucking insects, and the stem forms can be treated readily with kerosene emulsion; but there is another form, which resides on the roots of the tree. It is safe to say that where you see a Woolly Aphis on the limbs there are also some on the roots, and it is the root form that does the chief injury—the formation of gall-like enlargements. In treating them, watch carefully the stock as it comes from the nursery. One of our prominent fruit growers has found by experience that it has paid him over and over to dip the roots of his trees in tobacco liquor before planting them to kill aphis eggs and larvae which winter there. Fumigation will not kill the eggs. Another method of treating the roots is to mulch the soil around the trees with tobacco, so that the rains will carry down the solution among the roots. This may not be feasible in large orchards, but it is feasible where you have a few trees. It is a cheap application, but if the trees are small and you find the aphis on the roots, it is ten times cheaper in the end to uproot the trees altogether, as they will never thrive properly.

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Another insect made its appearance lately. In some apples which I received a few days ago from Stayner I found a number of holes. In one apple I counted eleven, some of them half an inch deep. In each of these holes a green grub was found. It works very late in the season, and I do not know the name of it, *and can find no reference to it in literature. It is a saw-fly. It is doing a good deal of damage, and it will be our duty, both at the Experimental Farm at Ottawa and at the College, to study it, and devise some method of treating it.

Next, in regard to the plum: The great disease of the plum is Brown Rot, and it is a difficult one to treat; in fact, I consider it one of the most difficult of orchard diseases to treat successfully. It requires early treatment; nothing but that will do; if you put off too late you will not succeed; and the treatment must be continuous. I think if these conditions are fulfilled, the rot may be controlled. You should use Bordeaux mixture and Paris green, and commence as soon as you can get on the ground. The "mummies" should never be allowed to remain on the tree, because they contain the winter spores, which will spread in the spring just as soon as the temperature is suitable.

Q.: Would winter spraying be effectual?

A.: I would not advise it, because the spores are not ripe till early in the spring, when spraying will destroy the winter form.

Q.: Will the spores spread from the mummies on the ground?

A.: Yes, to be sure—by the wind. My advice would be to gather all the mummy plums in the early winter. I have sometimes seen half the plums allowed to remain on the tree all winter. In such cases, I do not wonder that the spores spread. They will spread not only to your own trees, but to your neighbors'. Such a practice is a menace to the whole country.

Another disease that should be noticed is the Peach Leaf Curl. This may be controlled. I have reported on this in the Canadian Horticulturist. In spraying for Peach Curl, Bordeaux mixture, full strength, may be used when the tree is dormant. After growing begins, it is safer to use it only half strength. As I have already stated, begin spraying two or three weeks before the buds open.

VARIETIES: QUALITY VS. QUANTITY.

By Prof. John Craig, Cornell University, Ithaca, N. Y.

This is a plea for a fuller recognition of the axiomatic principle that it is better to study varieties before the trees are planted, than to accept the dictum of the agent or nurseryman, or follow the custom of the locality, and regret it in after years. A man should first settle with himself the type of fruit he desires to grow. Does he pride himself on the excellence of his product, or is he willing to secure an average price only? Does he wish to create a market of his own, or will he dump his product on the markets of the world? Would he grow for quality or quantity? Are his tastes of the Early Joe and Gravenstein order, or is his palate satisfied with Ben Davis and Gano? Which will give him most pleasure? The next consideration is what can he grow in most perfect condition. As time goes on the finer adaptation of varieties to peculiar sites and soils are becoming more apparent, yet far too little attention has thus far been accorded this feature of fruit growing. Is it not time that our principle orcharding regions were surveyed, so that the character of the soil, the site, aspect, the

* Since this meeting I have found the name—"Taxonus Nigrisoma." (See Coll. Rep. 1902.

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varieties, together with a statement of successes and failures, might be recorded, from which to draw deductions for the benefit of future planters. Here is work for the Fruit Experiment Stations. Local experience should be accepted for what it is worth. One must be able to distinguish between real experience and local bias. Some one says this is not a serious matter; if they do not prove to be the right kind, you can easily work them over. (Lockport man.) So you can, but you have lost four or five years by your indifference. Such negligence may spoil a man's chance for profits during his lifetime.

Factors Which Influence the Cultivation of Orchard Fruits.

1. Vigor and productiveness of the variety.
2. Character of tree in nursery.
3. Texture which enables the fruit to be handled and transported with ease.
4. Longevity or natural life of the apple.
5. Appearance, including size and form.
6. Quality, as measured by texture, flavor, and aroma.

The man who would cater to the world's markets—the larger mart—will consider the factors of productiveness and appearance of greater importance than those of quality and texture. On the other hand, should not he who would build up a high class trade, take into account the factors of beauty and flavor?

What kinds of markets are there? At a glance, it is seen that these are of two kinds: (a) the general, (b) the special. In the general, or world's market, quality does not rule. Appearance and stability are the standards by which the commercial value of varieties are judged. Uniformity of product is, in a measure, a guaranty of satisfaction. This market is world-wide, and prices are governed by the law of supply and demand. On the other hand, the special, or restricted, market is the one whose quality is rated at its true value; and where prices are guaged by the desire and financial ability of the purchaser and the marketing astuteness of the seller. The special market will always be a limited one, because a peculiar ability is required to meet its demands, and because the purchaser must belong to the class which can afford to indulge in luxuries. It is to be remembered that this market is capable of being cultivated. The producer may, therefore, enlarge the market by convincing the buyer of the superiority of his wares. (Oswego strawberry grower.) (Niagara grapes.)

What is the Present Trend in Orcharding? Unquestionably, it is overwhelmingly in favor of the low grade, general purpose apple. Superlative productiveness and vigor are usually coupled with mediocrity in quality of fruit. In peaches, the vigorous, handsome Elberta, of medium or poor quality, is being planted by the hundreds of thousands in peach regions. In pears, Kieffer, that lusty representative of a union between Oriental and European races, easily outdistances all competitors in the planting competition. They will handle, they will ship, they will keep. These are the recommendations. So it is with apples. No variety is being planted so extensively as Ben Davis. Not only is this true of the Mississippi Valley States, the natural home of ubiquitous Ben Davis, but it is characteristic of orcharding from Maine and Nova Scotia to Michigan and Mexico. What is to be the effect upon the market of this immense production of low grade fruit? Can we doubt that a just discrimination, based on intrinsic qualities, will not gradually assert itself? Are there not indications at the present day that Ben Davis is finding its level in those markets where a knowledge of its character has been acquired. Writing under date of October 20th, P M. Kiely, of St. Louis, Mo., says:

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"We sold Saturday, for instance, the day that showed the largest receipts and lowest prices of the season, a lot of Huntsman's Favorite apples, from J. L. Graff, of Murphysboro, Ill., at $3.50 per barrel. At the same time, really choice Ben Davis was offered at the levee at $1.50. We sold on the same day Grimes' Golden at $2.50 to $2.75, Rome Beauty at $2.00 to $2.50; Willow Twig, $2.25 to $2.50; Jonathan, $2.50 to $2.75; Northern Spy, Missouri Pippin, Gano and similar varieties, $2.00." This is the heart of the Ben Davis country.

Another dealer of Kansas City predicts that long after Mr. Kiely, with himself, has made their entry into the apple orchards of the other world, we will look down upon our brother merchants left behind, and will see them handling apples just the same, and three-fourths of them will be Ben Davis. We will look upon the orchardists setting out new orchards, and three-fourths of them will be Ben Davis! Judge Wellhouse, the apple king of Kansas, however, acknowledges the truth of Mr. Kiely's statement, but says the low prices were a result of peculiar conditions, and that Ben Davis and Gano are still the most profitable varieties. Secretary L. A. Goodman, of the Missouri Horticultural Society, reaches the core of the matter, to my mind, when he says that the Ben Davis of the Ozarks is not the Ben Davis of the north and east. Ben Davis is a variety that requires sun and heat to mellow, produce flavor and add juice. In the average of seasons I do not believe that this can be done in the best apple growing sections of Ontario. I do not believe that we should try to grow the apple that cannot be grown to the same degree of perfection as elsewhere when we can grow something else better. It is true that Ben Davis of large size and handsome appearance can be and is produced in Ontario; nevertheless, the proof of this pudding is distinctly in the eating. Compare this Ontario specimen with a well grown Ozark representative, and it is not difficult to realize that the Ontario individual is outclassed. But how can you turn the tables with crisp Spy, juicy King, and aromatic McIntosh! It is a matter of environment, and why not recognize it. Compare the flavor of a Concord grape, handsome, large, as it is possible to grow it in favorable seasons at Ottawa, with that found under the limestone escarpment of Southern Ontario or on the gravelly reaches of southwestern Lake Erie. Both look equally tempting, but oh, the difference in quality! Concord is a favorite table grape of mine when I can get it from the place of my own selection. The question, therefore, hinges largely on the factor of adaptation. Let us find the place where each variety reaches its highest state of perfection, and then cultivate our natural advantages. It is much better to do this than to try and adapt or acclimate a foreigner of uncertain qualities and attainments. This brings me back to one of the first principles enumerated, viz.: that as time goes on, quality, as influenced by local environments, will receive an increasing meed of consideration at the hands of purchasers and consumers.

Varieties to Plant: My recommendations would be of little value to you, because each one is more or less influenced by a personal bias. By all means in growing fruit grow your favorites, because I think a man might as well grow something he likes as well as something he does not like. These likes are very strong at times. I knew a man once who had such an antipathy for soft maples that he said he could not sleep if one grew near his bed. Looking at the fruit of the apple from the standpoint of quality and general external appearance, it is possible to throw them by a natural method of classification into more or less coherent and consistent groups. This is the field of systematic pomology. For instance:

1. Ben Davis group might contain Gano, Black, Ben Davis, and Beach.

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2. The Fameuse Group would contain McIntosh, Shiawassie, Princess Louise, Scarlet Pippin, etc.
3. Blenheim Group: Hubbardston, Ribston and Sutton.
4. Newton Group: Green and Peck's Pleasant, and perhaps Greening.
5. Spy Group: Ontario, Wagener.
6. Winesap Group: Stayman, Paragon, Arkansas.
7. Rome Beauty Group: Salome.
8. Alexander Group: a number of Russians and Wolf River.
9. Russet Group: Roxbury, Golden, Pomme Grise, etc.

Each of these groups of apples has certain more or less well marked characteristics which separate it from the others. These characters are intimately associated with definite climatic conditions. A knowledge, therefore, of these group characters, coupled with a knowledge of the place where the members of the group reach their highest degree of perfection, may be used to guide the intending planter. For instance, members of the Fameuse group are natives of the western portion of the St. Lawrence region in Quebec and Ontario. They reach the acme of their excellence on the islands of Lake Champlain and along the St. Lawrence. The relatively cool summer of this region brings out the handsome color, gives sprightliness to the flavor, and prolongs the keeping quality. In Southern Ontario and Western New York, Fameuse and McIntosh are rated as fall apples; neither are they as highly colored nor as crisp in texture.

Again, let us consider the Blenheim group, which we may say includes Ribston and Hubbardston. Ribston is native of the cool, equable climate of England. It is not strange, therefore, to find it a favored variety in Nova Scotia, while it hardly has a place in the commercial lists of Ontario. As we pass from the coast to the interior, the climatic conditions become less favorable for the development of its peculiar qualities; so it is also with Blenheim, and to a less extent with Hubbardston, possibly because the last named is a native of Massachusetts.

Returning again to apple products of our own country, we may cite the Ben Davis group, including Gano and Black Ben Davis. These are products of the middle west. To strengthen my contention, that locality has much to do with quality, I have but to draw attention to Downing's estimate of Ben Davis, based on specimens grown in the southwest. "Good, to very good!" he says, and he was usually conservative. I am safe in saying that it would be difficult to find confirmation of that opinion by a committee of Ontario experts passing judgment on Ontario grown Ben Davis at this meeting. (Mo. B. D. at Ames.)

A few years ago the Russian apple occupied a prominent place in the pomological stage. Great things were expected. The vast north was to be shorn of its ill repute as an inhospitable home for the apple. The fever has passed; a few varieties have been added to our list of early summer and fall varieties, and none to our list of reliable winter sorts. The impress of environment was upon these apples. They came from a region having a short, hot growing season, and when they had received their accustomed amount of heat in the new country, they ripened, whether the fruit grower desired it or not. Much good will come from this importation eventually, but in the mixed offspring is our hope, and not in the pure blood foreigner. Have I made my point clear? Local adaptations in the production of fruit of the highest excellence is worthy of our most thoughtful study. These problems are being studied by your Provincial experiment stations with a thoroughness which, so far as my knowledge goes, has no parallel in the fruit growing world of North America. It has been a pleasure to me to see their in-

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fluence for the good of horticulture grow and develop; it is a source of the keenest personal gratification to look over the reports of this Association of nearly a decade ago, and find that I was permitted to lend a helping hand in the organization of these now powerful factors in the educational work of the Association.

CONTROLLING SOIL MOISTURE IN THE ORCHARD.

By Prof. J. B. Reynolds, Ontario Agricultural College, Guelph.

In dealing with this subject, I shall present it under a number of heads, which you may enlarge from your own experience.

First, Preparation of the Land: Before planting the orchard it is necessary to prepare the land properly, and as you are all planting or replanting from time to time, I think that a few remarks under this head will be opportune. You must get the land into proper shape, and if possible, permanent shape, before the trees are planted. With this in view, the first step necessary is drainage. If the land is already naturally underdrained, then artificial underdraining is unnecessary, but it must be seen to, that there is good drainage—natural or artificial. The second point in the preparation of the land is deep cultivation. If the land is stirred and loosened up before the trees are planted, the roots are encouraged to go deep, rather than run along just below the surface, and they will feed from safer regions of the soil. This loosening of the subsoil is specially necessary where you have a heavy soil.

After the trees are planted, there are various methods of treating the land. One method is to put the orchard down to permanent sod. The advantage of that is very obvious—it is, perhaps, the easiest method of disposing of orchard land. I do not think that sodding an orchard is to be universally condemned; it depends upon the locality. There are, I am satisfied, some localities even in Ontario, where sod, so far as soil moisture is concerned, is good rather than otherwise. We must not forget that we have a wide difference even in Ontario as regards rainfall. The average rainfall at Toronto is about 31 inches; at Guelph it is 28 inches; at Port Arthur it is 24 inches. East of Toronto, at Montreal, it is 38 inches. So that as we go westward from the eastern part of Ontario till we reach the extreme west, the rainfall diminishes. It does not always follow the westward movement, however, but, as you would naturally expect, the rainfall around the shores of the Great Lakes is higher than in the interior. This probably accounts for the fact that in those sections—lake and river shores—we have a climate more suitable for the production of fruit. I am told that east of Toronto the sodding of orchards is not generally unfavorable to the yield of fruit. I believe that west of Toronto, taking Toronto as an arbitrary point of division, sodding of the orchard is rather objectionable from the point of view of moisture. Of course, grass in the orchard has the same effect as a number of pumps in the land, pumping the water out of it, and it is a question whether or not we can afford that withdrawing of the moisture from the land. I believe I am right that in this part of the country—in the interior of western Ontario—apples do not keep so well late in the winter as apples grown east of Toronto, in the neighborhood of Brighton and Belleville. The reason is, we allow the moisture in the soil in the western part—where moisture is less plentiful—to diminish so much that the apples ripen earlier in the season, and, therefore, what is a late fall or

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winter apple in the east, is a much earlier apple with us in the west. We can prevent that early ripening by keeping the moisture in the soil longer; and therefore sodding of the orchard cannot be approved in parts of the country where moisture is scarce.

Of cropping we may say much the same thing. The orchard may be profitably cropped, first, if the soil is rich enough to stand it, in which case it may be a good thing; and secondly, if moisture is plentiful enough; so that cropping also is largely a question of the local climate. It appears to me that, subject to the exceptions mentioned, the safest plan is not to sod an orchard nor to crop it, in the ordinary sense, but to use a cover crop. Let me mention briefly the advantages of a cover crop. By "cover crop" we mean a crop sown late in the summer, or early in the fall, allowed to remain as a cover or protection to the land during the winter, and plowed down the following spring. First, especially if it is a crop that winters over, it enables you to plow down and cultivate in the spring a little earlier, because the living crop dries the land out. After the early plowing, there remains bare cultivation for the summer, which enables you to conserve the moisture at that part of the year when it is most needed. We must be guided entirely by the conditions of the season as to how soon to plant the cover crop in the fall. If the season is moist, and likely to continue so, the cover crop may be sown much earlier, because under such conditions we can sooner afford the loss of moisture from the soil. In California, where they have to irrigate, and where they grow sugar beets, when they want to ripen the beets in the late fall they irrigate the land—wash it all over—and that dries out the soil and ripens the crop. That looks like a paradox, but it is the practice followed in that country. The reason for the success of the practice is that the irrigation water does not penetrate more than a few inches into the soil, but it destroys the surface mulch, starts the capilliary movement of the ground water upwards, and thus encourages evaporation, so that the land is dried indirectly by this irrigation. So if we want to dry out the land and ripen our crop of apples and also the new wood, we may do it by stopping cultivation and still further by planting a cover crop. Further, the cover crop affords opportunity to cultivate, thus keeping the land of a proper texture. We do not yet, with all our knowledge of the soil, sufficiently appreciate the necessity of good texture in the soil—of having it in the right physical condition. That texture cannot be got without proper cultivation.

With regard to spring and summer cultivation, that must be done according to the kind of soil we are cultivating. The heavy clay soil must be loosened up as much and as often as possible. On the other hand, the sandy subsoil may require to be compacted, in order to prevent loss of soil water by percolation. Therefore, I should say, for heavy clay soils occasional deep cultivation, with shallow cultivation in summer, for sandy soils, continuous shallow cultivation. That is as near as one can get to a general rule.

Q.: How about injury to the roots in deep cultivation ?

A.: If the land has been properly handled before the trees are planted, the roots will be well out of the road of even the deepest cultivation. Even then, root pruning, if not excessive, is not objectionable, but rather an advantage than otherwise.

Mr. W. T. Macoun, Central Experimental Farm : I should like to caution the Institute speakers about recommending certain systems of culture, and of conducting fruit plantations without studying well the conditions of climate, soil, etc. Our climate in the east is very different from yours. For instance, with regard to the clean cultivation of orchards to which Prof. Reynolds referred, if the Institute speakers were to come east and recommend clean culti-

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vation, without impressing on the people that they must have a good cover for their orchards in the autumn, there might come a severe winter, and the chances are the orchards would be cleaned out from root killing. It is somewhat difficult sometimes to get a good cover crop, and I believe it is wiser in the east to recommend sod culture, because as a rule the general fruit grower cannot keep in mind all the principles that must be observed, and would be very likely to cultivate and not use cover crops. In fourteen years' experience at the Experimental Farm we have never suffered from drouth, and I, therefore, conclude it would be wiser to recommend sod with top dressing of the sod rather than clean cultivation and cover crops.

REPORT OF COMMITTEE ON SAN JOSE SCALE.

By George E. Fisher, Provincial Scale Inspector.

In speaking to an audience at Walkerton, where the San Jose scale is not known to exist, I think it may be well to refer briefly to its life history and general behavior on the trees, and to some of the other scales. There are about eight or ten different scales that have become sufficiently plentiful to be injurious to our fruit trees. They are divided into two classes, the armoured and the unarmoured. These are again sub-divided into those that reproduce by eggs, and those that bring forth living young.

The Oyster-shell Bark Louse, the Scurfy Bark Louse, and the New York Plum Scale reproduce by eggs, and are single-brooded. Then we have the Putnam, the Ostreaeformis or Curtis Scale, the Cherry or Forbes Scale, and the White Rose Scale. These are multi-brooded, and also reproduced by eggs.

The San Jose Scale, however, is distinct from either class. It lays no eggs at any time of year, but gives birth to living young, and for this reason is more susceptible to treatment than the egg-laying scales, it being difficult to destroy the vitality of eggs. The color of the larva is a bright lemon yellow, which makes it easily discernible to the naked eye. They are sometimes so plentiful that badly infested trees have a yellowish appearance. When the young larva has found a suitable place to settle, it inserts its threadlike beak through the bark into the juicy tissues beneath. In the course of their growth, the males moult twice and mature in 24 days, after which they have a second period of liberty; after they fix, the females never move again, moult three times, and mature in 30 days. At about 35 days they are giving birth to young, and continue to do so for a period of six or seven weeks. You see, therefore, that the young of the first brood will be giving birth to young themselves before their mother has completed her brood. This accounts for the Scale being present at all times of the year in all conditions of development, except, of course, in the winter, when there are no larvae running.

There is one point in regard to the appearance of the San Jose Scale that I should like to bring particularly to your attention in order that you may be better able to recognize it. When the larvae fix, they throw out a waxy secretion from the pores of their bodies, which forms a covering or scale. The first condition of this cover scale is white, then greyish, shading off gradually into black by the time the insect has reached the half grown stage. On the top of the cover-scale there is formed a deeply corrugated ring, having a distinct nipple in the centre. You will find this ring in connection with other scales, but it is not nearly so deeply cut. The San Jose Scale also has the quality of distributing itself over the tree. Wide distribution and a very distinct nipple and ring are characteristics which clearly indicate the species.

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With regard to the spread of the scale in Ontario, I think the conditions of the country are very similar to what they were a year ago. I have not heard of the existence of the scale at any new points. Yet, in sections where it has become established, the destruction has been very great indeed, greater than was anticipated by most people, because it was supposed that the cold season would interfere with its increase and distribution; but it does not seem to have had much effect. The winter was mild, and the scale came through with little loss. Only the weak scales are killed by the winter; that is, the little ones that are not sufficiently advanced, and the females that are developing young.

The feeling of indifference that seemed to have hold of the people at the beginning of the inspection has almost entirely gone. There is no such thing as ridicule any more, and most of those who are interested in orchards are disposed to take up the fight. I have considerable correspondence with those who are anxious to know exactly what should be done, which is a very encouraging feature. As soon as it became known that it was not practicable to exterminate the scale by the destruction of infested trees, we set about finding remedies. Whale oil soap was used. Crude petroleum, diluted and undiluted, with and without soap. Applied with a combination emulsion pump, and in the form of a prepared emulsion applied with an ordinary pump. Lime and sulphur, with and without salt, in proportions varying from one-half pound of lime and one-quarter pound of sulphur to two pounds of lime and two-thirds of a pound of sulphur to the gallon of wash. Fumigation with hydrocyanic acid gas and several other remedies during winter. For summer treatments we used crude petroleum emulsion and kerosene emulsion. Whale oil soap is a good remedy, but expensive. It is a rather mild remedy, and not likely to do any harm to the tree if applied during the last two weeks in April, but if used in the winter before the frosts are over, it will destroy the blossom buds.

Crude petroleum is much more fatal to the scale than soap, and may be used to good advantage on trees that will resist it. If used undiluted, it should be applied with a fine nozzle having an opening not larger than 1-30th to 1-40th of an inch in diameter. The effect of soap is to lessen the severity of oil treatment. We also experimented with an emulsion of crude petroleum and soap, and found that it makes a splendid remedy. The formula for winter use is 1 gallon crude petroleum, 2 1-2 pounds whale oil soap, and water enough to make 5 gallons. This gives one-half pound of soap to the gallon, and 20 per cent. of oil, or 1 in 5, and 1 in 10 is strong enough for foliage. It is much more trying to the foliage than kerosene emulsion. I think the danger from the use of crude petroleum is too great to recommend its use on peach trees.

Two years ago we began to make experiments with lime, sulphur, and salt. This remedy is very popular in California, but was condemned in the east on account of the heavier rainfall. We used it with and without salt, and secured the best results where no salt was used. This mixture has given very satisfactory results, and has the advantage of being cheaper than any other remedy. I think I may say of it that it is cheaper, safer, more effective, and with the application of steam in its preparation is more easily prepared than any other remedy. The formula found most useful is one pound of lime and one-half pound of sulphur to the gallon of wash. I must, however, point out that its efficiency depends on its being sufficiently cooked. The difficulty lies in dissolving the sulphur. This may be done by boiling in a kettle, which is too slow for a large orchard. The method of cooking that has been adopted lately is to utilize steam from ordinary threshing engines, which serves

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the purpose admirably. There are two lines of inch pipe which convey steam and cold water to each of a row of barrels, where they are controlled by stop-cocks. The barrels are filled one-quarter full with cold water and the steam turned on, say, four barrels at first. With eighty pounds of steam pressure these will be boiling in five minutes. The steam is then turned on four more barrels and off the first four, into which the lime and sulphur are introduced as rapidly as is possible without causing them to boil over. When the lime is all in and slaked, steam is again turned on, and a small stream of cold water sufficient to fill the barrels in the course of two hours' cooking. In this way the mixture can be applied faster than it is likely to be used. The mixture must not be allowed to become cold before being applied to the trees, as the materials in it apparently crystallize and cannot be redissolved. One great advantage of this mixture is that the lime leaves the trees white after they have been treated, and it is very easy to observe whether any part of the tree has been missed, and if so to go over these spots again.

With regard to summer treatment, I may say we had difficulty in finding a remedy that would destroy the scale without injuring the foliage. We tried a great variety of treatments, and found that kerosene emulsion fills the bill well, and that the cheaper grade of Canada kerosene is better than the more expensive grade. The formula we recommend is one part of kerosene in six parts of emulsion for apple, pear and plum, and one in seven for peach, emulsified with whale oil soap in the proportion of half a pound to each gallon of kerosene. The proper preparation of the emulsion is very important. We found the best way to get a good emulsion is to dissolve the soap in half as much water as oil used, and bring them to a boil. Throw the boiling soap and water into a barrel over the oil, and churn violently for five minutes, then slowly, while the quantity is being increased with cold water. Soft water is best for emulsions.

The weather should be dry and clear when this emulsion is used. It should be weather that will evaporate the oil quickly. We have had decidedly the best results when the weather was hot and dry ; the dryer and hotter the better. We have also had very good results, when the weather was favorable, with one part of crude petroleum in ten parts of emulsion ; crude petroleum, however, is more liable to injure the foliage than kerosene.

Fumigation with hydrocyanic acid gas is looked upon by most people as being too complicated a method to be practicable. If I had an infested orchard of small trees that was sufficiently isolated to be relieved from the danger of reinfestation from outside, I should consider fumigation a most excellent process for getting rid of the scale. It is so important to destroy the last one that remains to reinfest the tree. Fumigation, if properly done, will, in my judgment, reach that last scale. We fumigated some trees last winter when the temperature was away below zero, when it is supposed the scale is in a dormant condition, and there is no breathing, but I have concluded there is no time when they do not breathe more or less, and, therefore, are in some degree susceptible to the gas. We used cyanide in the proportion of 20, 30, 40 and 50 hundredths of a gramme to the cubic foot enclosed, giving an exposure of three-quarters of an hour. When spring opened we found no live scale on any of these trees except those treated with 25-100's the proportion generally used for fumigating nursery stock, which is entirely effective at the season of the year when this work is done. In July we treated some stock trees in the day time without injuring the foliage, using one-seventh of a gramme of cyanide, and giving twenty minutes exposure, with apparently perfect results in killing the scale. All this would seem to indicate that

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the scale is more susceptible to gas treatment when it is active than when dormant, and the more active it is the more susceptible. We think this is true with any treatment.

In regard to nursery fumigation, I have reason to believe that if it is carefully attended to it is effective, and, further, that it is carefully attended to at all important points, as it is under the supervision of a man appointed by the Department to look after it.

Q.: Can you tell us at what degree of frost the scale is destroyed ?

A.: In my judgment it will live wherever fruit trees will live. It winters successfully in St. Paul, Minn., where they have it forty below zero.

Q.: Will lime and sulphur clean up a tree as well as whale oil soap ?

A.: Yes ; very much better, and kill the scale better.

Q.: What about its effect on Curl Leaf?

A.: It is one of the special treatments for Curl Leaf in California. It is also an acknowledged remedy for mildew.

Q.: Did you ever try tobacco water ? In the Leamington district this wash is considered one of the best preventives of insect attacks. Tobacco grows in our section, and we get the stems for nothing. They are steeped in hot water for an hour, and then diluted in the proportion of one pound of stems to the gallon of water. The mixture will not hurt melon vines, but it kills the lice. The stems could probably be delivered at outside points for $10 per ton.

A.: I have only used tobacco in destroying the aphis.

Q.: Have you had any experience with lime and sulphur in the combined form ready to be dissolved in hot water ?

A.: No. The material requires boiling for two hours, and to be used before its cools ; otherwse it crystallizes, and cannot be restored to its original condition by hot water.

Mr. Macoun : Have you tried lime alone again ?

A.: No.

Mr. Macoun : I thought that two years ago you made some experiments with lime. We found lime a perfect remedy for the oyster-shell bark louse. I think that good fresh lime applied hot would be worth trying.

Mr. Fisher : I think that perhaps the investigations into the results of the work done at that time were not sufficient. On examination we found the female scale still alive, and concluded that the remedy was a failure. But a little later on, when the breeding season commenced, we found that while the trees that had not been treated were swarming with larvae, no larvae could be found on the treated trees. The mothers were there in a fat and healthy condition, but under the microscope they showed not a single larvae and contained no young. Now we know that in the over-winter brood there are three or four times as many males as females. We know further that later in the season the female has in herself the power of reproduction, but at the beginning of the season the fact that there are so many more males than females would seem to indicate the necessity for a very perfect fertilization of the females early in the season. It was evident in the case in point that the males had been destroyed by the treatment, while the females had escaped. The reason for this is that the females are protected beneath the incrustation of several generations.

W. H. Bunting, St. Catharines : Mr. Fisher has gone into the details of his work in the last few years, and I think that as fruit growers the thanks of every member of this Association is certainly due to the Department of Agriculture for the earnest effort they have made to assist us in this difficulty. We have now reached a stage in the work that has passed that of experi-

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ment, and the Inspector has succeeded in demonstrating to a very great extent the efficacy of the lime and sulphur treatment. All these other treatments and remedies are beneficial, and we have advocates of them all in the different districts. One objection to whale oil soap is its expense. So long as the Department could come to the assistance of the grower and pay part of the cost, it was not felt to be such a burden, but now that we are thrown upon our own resources it is a different matter. In crude oil there is danger, as Mr. Fisher has stated, to certain classes of trees. When we come to lime and sulphur, we find that it is a safe and cheap treatment, and one that indicates from the white appearance of the trees whether the work has been performed thoroughly or not. I think this is a very important point, because unless the scale is covered with the preparation used, destruction will not result.

What are we going to do about this matter? We have the scale with us in some sections, and whether it is on our trees or not we are all interested. Unless determined efforts are made to combat it, sooner or later the pest will have obtained a foothold in all our orchards, and they will be of much lessened market value in consequence. We have had great help from the Department, but I do not know to what extent it will be continued; and it seems to me that we should now unite and co-operate to provide the material and get it on the trees in the most effective manner possible. The idea of co-operation is the one thing I wish to bring out. We all have an interest in the matter, and must be up and doing if we are to control this scale.

Mr. Creelman: The scale question is one of the most difficult the Department has ever had to contend with. Mr. Fisher has labored hard in its extermination, and yet we have it. We want to bring all the facts from this and other countries to bear and endeavor to help Mr. Fisher and the Department. I see it is stated in British Columbia that lime and sulphur can be obtained in the combined form. You will realize what an immense amount of work would be involved in boiling the mixture in a kettle for two hours. Mr. Fisher has solved this to some extent by employing the steam from a threshing engine for this purpose. I should like to ask Mr. Palmer the experience of British Columbia with the remedy in its combined form.

Mr. R. M. Palmer, Freight Rate Commissioner for British Columbia: My experience leads me to believe that the conditions have to be carefully studied in each district before you are safe in arriving at conclusions. After examining the conditions in California and Oregon and the methods adopted there, we were satisfied to adopt them in British Columbia. I am glad to tell you that although we have very little trouble with the scale there, we have found that the use of this wash has been followed by the very best results in our orchards. When they first began to use the remedy in Oregon, they found the same difficulty in dissolving the sulphur, but finally hit upon a combination in a solid form. We imported a quantity of this mixture, and it was found entirely satisfactory. We afterwards induced one of our manufacturers to prepare the material, and this was done under the superintendence of the Board of Horticulture, so that we were assured that it was properly made. I do not know to what extent it could be adopted here, as the conditions may be different.

The greatest danger with the San Jose Scale or any other insect pest is from the man who has only a few trees. He takes the greatest amount of looking after. The large grower, on the other hand, will usually avail himself of every means to rid his orchard of these pests. We have found the best results to follow the use of freshly made mixture, so that although you can make a solid form, it should not be kept too long before it is applied.

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Q.: Do you apply hot ?

A.: Yes ; in making the solution from the solid form, hot water is used ; usually boiling water. I notice that you omit the salt from your mixture. As we understand it, the use of salt is to cause the mixture to adhere to the trees. I do not think it has any other value.

Mr. Fisher : What is the object in that ? I understand that in Southern California they have discarded the use of salt.

Q.: Do they use copper sulphate in their wash in Oregon ?

Mr. Palmer : They have another formula which contains it. This has given better results in some districts. We find that lime, sulphur, and salt is of decided value against fungous diseases where we have no scale at all.

Mr. Fisher : Do you understand the method of preparing the lime and sulphur in solid form ?

Mr. Palmer : To a certain extent. The principle of it is this : The mixture is made in a steam jacketed vat, such as you find in soap works, and the water is evaporated from it.

Q.: Have you the San Jose Scale in British Columbia, and have you the Codling Moth ? If so, to what extent ?

Mr. Palmer : We had some cases of scale, but not during the last three years ; in every case the infested area has been destroyed. In regard to the Codling Moth, we have endeavored to prevent its introduction by a system of inspection.

REPORT OF COMMITTEE ON NEW FRUITS.

By Professor H. L. Hutt, Horticulturist, Agricultural College, Guelph.

For the benefit of those present who may not be familiar with the work of the New Fruits' Committee, I may say that this is one of the standing committees of this Association. The members of the Committee are : Mr. L. Woolverton, Editor of the "Canadian Horticulturist," and Secretary of the Board of Control of the Ontario Fruit Experiment Stations ; Mr. W. T. Macoun, Horticulturist at the Experimental Farm, Ottawa ; and your humble servant, the Horticulturist at the Ontario Agricultural College, Guelph.

The duty of this Committee is to receive samples, take note of, and report upon all of the promising seedlings or new varieties of fruits which are from time to time making their appearance in various parts of the country.

Our duty is not to report on the merits or demerits of those new varieties which have already received the distinction of a name and a place in the nurseryman's catalogue ; to test and report upon them is the work of the Fruit Experiment Stations ; but it is, as we understand it, to introduce to the public those new varieties which have not yet had such distinction, and to recommend for further trial such as are likely to be worthy of propagation.

At the last meeting of the Board of Control of the Ontario Fruit Experiment Stations, it was decided that all such new varieties as are recommended by this Committee as worthy of trial, should be obtained for testing at one or more of the Fruit Experiment Stations. This, we think, is desirable for two reasons : First, because it will guard against the loss of any new variety ; and, second, it will afford a thorough test for each kind before it can be offered to the public, and thus guard against worthless varieties being distributed which never should have been propagated.

In this connection, as in the past, we intend to be very careful about recommending for further propagation any new variety unless it has some

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quality or qualities likely to make it more valuable than the many named varieties now under cultivation. What we need now in most classes of fruits is, not more varieties, but fewer varieties and better quality.

At the request of some of the members of our Association, we made an attempt a couple of years ago to get some information regarding new varieties which originated in the United States, but all our inquiries met with little or no reply. Since then we have been considering the question, and we have decided that for several reasons it will be just as well for us to confine our attention to the seedlings of our own country. In the first place, we are more likely to find among these something of value for our own country; for, as a rule, varieties are of most value near where they originate. And in the next place, we may rest assured that if our American cousins do find something of value, we will not be long in hearing about it. The first thing for us to do in such a case would be to give it a fair trial at one or more of our Experiment Stations.

The following are the most important seedlings which have been brought to our notice during the past season :

Seedling Apples.

There is already such an extensive list of varieties of apples under cultivation, and the season is so well covered by good varieties from early to late, that it would be a mistake to recommend for propagation any new variety unless it possesses some good quality in a marked degree over those varieties now under cultivation.

Samples of twenty-four seedling apples were received by our Committee, only half of which are mentioned below, and only one of these is deemed worthy of further test.

No. 1. From James Blair, Aberfoyle, Ont.:

A medium-sized green apple, with a red cheek ; something like a Rhode Island Greening. The tree is said to be very productive, and the fruit keeps as long as the Greening.

A good apple, but in no way superior to Greening.

No. 2. From T. G. Allanby, Galt, Ont.:

A modern-sized, handsome fall apple, a little like Maiden's Blush, but having a much deeper cavity and basin. The quality is fair, but not enough better than Maiden's Blush to make it worthy of propagation.

No. 3. From Geo. P. McNish. Lyn, Ont.:

A large, white fall apple, having a crisp, white, juicy flesh and pleasant sub-acid flavor. Would make a nice dessert apple for home use, but would be too tender in the skin to be of any value commercially.

No. 4. From Peter Dunbar, Guelph, Ont.:

A medium-sized, yellow summer apple ; but not so good as Primate or Yellow Transparent.

No. 5. From C. A. Cass, L'Orignal, Ont.:

A large, handsome red apple, of good quality ; in season about September. The tree is said to be "a wonderful bearer," and is loaded nearly every year. Mr. Macoun thinks this might prove an acquisition, coming in between Duchess and Wealthy.

No. 6. From J. P. Cockburn, Gravenhurst, Ont.:

In all respects so much like Duchess that it would be useless to give it any other name.

No. 7. From Thos. Beall, Lindsay, Ont.:

A large, roundish, conical apple, somewhat angular. Stem short and stout, in a deep cavity ; calyx open in a deep basin. Color yellow, washed with

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orange and purplish red, mostly on sunny side. Flesh yellow, tender, juicy. Flavor rich, pleasant, sub-acid; quality very good. Season, September and October. Tree said to have been bearing five or six years.

Mr. Macoun says: This apple is quite promising, and well worthy of being given a thorough test.

No. 8. From C. L. Stephens, Orillia, Ont.:

A medium-sized apple of yellowish green color, well splashed and washed with deep red. Evidently a seedling of Fameuse, as it resembles that variety in several particulars; but it is in no respect superior to it.

No. 9. From Mr. Marr, Simcoe, Ont.:

A large, coarse, greenish-yellow apple, with bronze cheek, in season about October. Too coarse for dessert, and not long enough keeper to be of value.

No. 10. From J. R. Ballantyne, Ottawa, Ont.:

A very large, red fall apple, but not sufficiently promising to make it worthy of propagation.

No. 11. From F. Birch, Wode House, Ont.:

A seedling from the Fameuse, pale green in color, with a bronzy or dull red cheek; flesh, like its parent, white, and of good quality, but not worth propagating when compared with Fameuse or McIntosh.

No. 12. From T. W. Gibbs, Bracebridge, Ont.:

A medium-sized, pale green apple, splashed and streaked with purplish red; of fair quality, and something of a Fameuse flavor. In season about September, but not sufficiently valuable to take the place of Duchess or Fameuse.

Seedling Pear.

The number of varieties of pears in cultivation in this country is not so great, but there is room for a few more good varieties, particularly those which have greater hardiness, and also those having fruit of greater keeping quality.

In our report last year, we mentioned a promising seedling pear raised by Mr. E. C. Beman, Newcastle, Ont. This is a large, handsome pear, somewhat resembling Sheldon; but I hesitated about recommending it last year because the texture and quality were hardly what I thought they should be in a variety, if it was to be added to the list now in cultivation. As Mr. Woolverton and Mr. Macoun both spoke well of the quality of the specimens they sampled, I concluded I might have tested those sent me a little too early, so I asked Mr. Beman to send me another lot this year. This he did on the 23rd of November, just one month later than last year. In the letter accompanying them he says: "I have kept them as long as I thought advisable. They are now in about right condition for eating. I think probably you did not let them get soft enough last year. They will get very soft, without rotting at the core, which is one good quality they possess." After trying these again this year, I can say that when they are kept long enough the texture becomes as melting or buttery as could be desired; but as regards the quality, I think Mr. Beman in his letter last year has very fairly said all that could be said in their favor: "The quality is not so good as I would like, but it is much better than that of many varieties considered first-class for market." I think the variety is well worthy of further trial, and would recommend it to be thoroughly tested at one or more of the Fruit Experiment Stations.

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Seedling Plums.

No seedling plums were sent to the committee this year, but mention should be made of the native plum seedlings which are grown by H. C. Carstesen, Billing's Bridge, Ont. (near Ottawa). Mr. Carstesen does not grow seedlings for experimental purposes, but for profit. Practically every tree in his little orchard of between 300 and 400 trees is a different seedling. His most promising varieties are those which ripen early in August before any of the named American varieties. Some of these are of very good quality, and he gets high prices for the fruit, as there is little competition in plums at that time.

A large number of seedling American, European, and Japanese plum trees are now growing at the Central Experimental Farm. Already some very promising American seedlings have been originated, two of which were named last year. The following are two which are thought worthy of being named:

No. 1. Consul—a seedling from Wolfe.

Roundish; large ; cavity narrow, medium depth ; suture a distinct line ; apex round ; deep red ; dots moderately numerous, yellow, distinct ; bloom light ; skin moderately thick, tough ; flesh deep yellow, juicy ; stone medium size, oval, flattened, almost free ; quality good.

Will probably prove a useful late plum. Ripened September 24th in 1901, and October 14th in 1902.

No. 2. Sunrise—a seedling of De Soto :

Oval ; large ; cavity narrow, shallow, abrupt ; suture a distinct line, not depressed ; apex rounded ; yellow, more or less covered with bright red ; dots few, yellow, distinct ; bloom moderate ; skin thick, moderately tough ; flesh deep yellow, juicy ; stone large, flat, oval, practically free ; flavor sweet ; quality good ; season———— ; promising.

Seedling Peaches.

The peach, one of our choicest Canadian fruits, is extensively grown in the southern sections of the Province, particularly in the Niagara and Essex peninsulas. In the inland and northern sections it is grown only to a limited extent, and that only in sheltered situations. One of the most desired qualities, then, in new varieties of peaches is greater hardiness; and I believe we will yet obtain varieties hardy enough to enable it to be grown much more widely than at present.

If we are to have such varieties, I believe also they will be found among seedlings grown in northern and inland sections. At Guelph, we are so far inland, and our climate is so severe that the idea of buying and planting peach trees there is seldom thought of, yet in and about Guelph there was grown this year, on seedling trees, probably over a hundred bushels of excellent peaches.

Through the kindness of the editors of the Guelph Daily Mercury, who took the matter in hand and stirred up quite a boom in peaches, we were enabled to procure samples of fruit from 30 different seedling peach trees fruiting in Guelph this year.

In this connection it may be well to mention just one other feature, which must not be lost sight of in looking for new varieties, and that is that peaches may be had in season for at least three months of the year.

At our Fruit Experiment Station at Leamington we have under test about 150 varieties, and from among these it is possible to select a dozen varieties that will give peaches in season from July to November. The best vari-

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eties, as a rule, come in about midseason. All of the very early varieties are white-fleshed cling-stones, of somewhat inferior quality, while the fruit in greatest demand in the market and for canning are yellow-fleshed free-stones of high quality. If, then, besides getting varieties of greater hardiness, we also get varieties of better quality, we will be supplying a requirement of growers even in the most favored peach sections.

Amongst the Guelph seedlings there were no early ones, all of the fruit being received between the middle of September and the middle of October. Of the thirty varieties examined, at last one-third of them would rank as first-class peaches, and had it not been that in many cases the trees were allowed to overload, probably one-half of them might have been so graded. We have not time to speak of all, but would mention a few of those which were most promising:

No. 1. From Walter Grierson, Galt street:

A large, handsome, yellow-fleshed freestone; ripe September 25th.

No. 2. From Wilber Snyder, Glasgow street:

A good-sized, yellow, showy peach, with bright red cheek; freestone; ripe September 20th; tree six years old from seed, and bore about a bushel this year.

No. 3. From Wm. Cowan, Paisley Block:

A large, showy, yellow peach of the Crawford type; freestone, of good quality; ripe September 20th.

No. 4. From the late Dr. Cowan, Trafalgar Square:

A large, oval, red-cheeked, yellow-fleshed peach; freestone; of good quality; ripe September 25th. Tree only 4 years old; in exposed position, and bore 40 fine peaches this year. Name suggested, "Polar Beauty."

No. 5. From Samuel Brown, Devonshire street:

A good-sized, handsome yellow peach; a freestone of fine quality, and with very small pit. Ripe September 25th. Tree eight years old, and bore a bushel and a half of fruit this year.

No. 6. From Edwin Sanderson, George street:

A large, showy, yellow peach; a freestone of good quality. Ripe September 25th. Tree five years old, and bore a basket of fine fruit this year.

No. 7. From Miss A. Smith, Norwich street:

A very large, handsome, yellow peach, with red cheek; a freestone of excellent quality. Ripe September 25th. This was one of the finest of the lot. From a young tree fruiting this year for the first time, which bore twenty peaches.

No. 8. From Mrs. Bower, Derry street:

A large, showy yellow peach, from a six-year-old tree, which bore nearly a bushel of fruit. Ripe about October 5th.

No. 9. From John Bowman, Wood street:

A very large, handsome, yellow-fleshed peach; freestone, of excellent quality. Ripe October 1st. From a tree eight years old, which bore only about one dozen peaches.

From the most promising of the above list we have procured quite a number of pits, which have been planted at the College, where we intend to grow the seedlings in a less sheltered situation than most of them are grown in the city, in the hope of fixing, if possible, their hardiness, without losing any of their other good qualities.

This plan of raising seedlings from the finest specimens of northern grown fruits is well worthy of a trial by those outside of the peach sections, who would like to grow this luscious fruit for themselves.

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The pits should be planted in the fall, while they are fresh, and the trees should be given plenty of room for development, and not be over-protected. If any protection is given, it should be from the warm sun in the late winter and early spring, which often causes the too early swelling of the buds.

Seedling Gooseberries.

Mr. C. L. Stephens, of Orillia, has given a good deal of attention to the improvement of the gooseberry, and has been raising quite a number of seedlings. Two years ago, we reported upon several of these, and this year Mr. Stephens has sent us a half dozen more, which are well worthy of further trial.

No. 1—Is a large red, oval berry, much like Industry, and said by Mr. Stephens to be one of his best.

No. 2—A large pale-green, oval berry, said to be a strong grower and very prolific.

No. 3—Called "Imperial Seedling," is a large green, oval berry, of thin skin and good quality.

No. 4—Called "Foundling," a medium-sized, bright red berry, somewhat spiny, and said to be the best of its size.

No. 5—A large yellow, oval berry, thick skinned, and said to be very productive.

Currant Seedlings.

A large number of seedling black currants have been originated by Dr. Saunders at Ottawa, quite a number of which have been named and described in the annual reports of the Central Experimental Farm. Another one has been named this year, which perhaps is the best of all. It has been called "Topsy."

Topsy: Fruit large, black, very glossy; sweet, fine flavor; quality, very good; productive; ripens evenly, and clings exceptionally well to the bush, which makes it exceptionally valuable.

Hybrid Crab Apples.

A number of Dr. Saunders' cross-bred and hybrid apples fruited this year. The following five varieties, which compare favorably with those named previously, were named this year:

Prince—Pyrus bucatta (female).....X Tetopsky (male)
Manitou—Pyrus bucatta (female).....X McMahon White (male)
Tony—Pyrus bucatta (female).....X McMahon White (male)
Alberta—Pyrus bucatta (female).....X Haas (male)
Elsa—Pyrus bucatta (female).....X Yellow Transparent (male)

Some of these may prove useful in Northern Ontario or the Northwest.

H. L. HUTT,
W. T. MACOUN,
L. WOOLVERTON.
Committee.

Prof. W. T. Macoun: The fact that we received so many seedling varieties for examination shows the appreciation of the people of Ontario in the work of the Committee. We have only recommended one variety of apples

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for name. We do not believe in recommending anything that we do not consider better of its kind than any of the commercial varieties already on the market. But we must remember that we have many districts in Ontario to take into consideration, and varieties that might not seem to be of much value in one section might be of great value in others. For instance, in Eastern and Northern Ontario we are looking for a winter apple, and a winter apple which you might not think much of might be considered of great value in those sections. The plan I work on, therefore, in passing judgment on the seedlings submitted is to make a list of those I consider most suitable for various parts of the country. In my district, for example, I take for a standard those varieties that are already recognized as the leading varieties, and if the specimens submitted do not come up to these, they are not recommended.

In connection with this question of new varieties, it is interesting to note that our present standard fruits are the result of selection from unlimited numbers of seedlings produced during a long period in the United States. To show how many varieties are required to provide something of merit, I may say that 3,000 Russian seedling apples, which had been grown in latitude 60, have been tested at the Ottawa Experimental Farm, but failed to get anything that would be of value to Northern Ontario. The reason for this is that Russian apples are grown in a short season, and they necessarily mature quickly. The consequence is, that when they are grown in our comparatively long season, they become summer apples. What we want is an apple that takes a long season to mature, and we shall have to look, I think, to the southwestern States for some of our best winter apples. Such apples, requiring a long period for maturing, would, when grown in our comparatively short season, become a winter apple.

We are trying to do some work at Ottawa in originating new kinds of apples. We grow a large number of seedlings from standard varieties, and hope before long to be able to put before the Society some winter apples that will be better for some districts than those you have at the present time.

I think that in future in recommending new varieties we shall have to consider their power in resisting insects and disease. I was glad to hear from Mr. Palmer that in British Columbia they are giving this matter serious consideration. If in this way we could reduce the necessity for spraying, it would be a great thing.

Mr. F. Metcalf, Blyth: I think if it were better known where seedlings could be sent to be tested, it would facilitate the work.

The President: Prof. Hutt and Prof. Macoun are always glad to receive and test them, either at Guelph or Ottawa.

Mr. Woolverton: In behalf of the Experiment Stations, let me say that we are always anxious to get trees and fruits that are really worthy of being tested. Our plan is to try to secure plants of the varieties recommended by this committee, and to test them at the various stations, so as to decide definitely as to their merits.

Mr. Joseph Tweddle, Fruitland: With reference to the pest-resistant varieties, I think we should be careful before we discard our old and well established varieties. We have been looking in that direction, and the result is the Ben Davis. When looking for strong varieties, there is a danger of going down hill in point of quality. Instead of looking for disease-resisting varieties, we should take greater care of the more tender varieties of good quality that we now have.

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REPORT OF THE COMMITTEE ON THE CODLING MOTH.

Your Committee have to report the following: We are pleased to state that on account of the low temperatures of the past season, comparatively little damage has been sustained by the work of this much-dreaded pest. We know of no municipality, other than the Township of Saltfleet, where any attempt has been made to control it by the adoption and enforcement of the Insects' Act and its provisions therefor; and in this township we have to report only a very lax enforcement by our municipal board. This we regret, and have only to account for it from two causes: First, the heavy expense re the thorough inspection for San Jose Scale, costing the municipality over $700.00, and secondly, the almost total extinction of the codling moth by weather conditions of this season, and the very light crop of the previous year. The bandages were removed and examined early in July in many orchards, and so few larva found that to many growers it seemed unnecessary to continue the work. However, later in the season the larva appeared in variable proportions, but on the whole only a small proportion of the crop was affected, but where the bandages were well and thoroughly attended to, almost perfect immunity from damage resulted. And notwithstanding the lax enforcement by our council in Saltfleet township, your committee believe, and would respectfully submit, that a general adoption and enforcement of the Act for its suppression is advisable and necessary.

Patent tree protectors are in use to a small extent, but as none of your Committee have used them, and as reports concerning them are to come from the Experimental Stations, we respectfully submit the above.

Signed in behalf of the Committee,

JOSEPH TWEDDLE,
Chairman.

Mr. Tweddle: We arranged that later in the season the Committee should examine some of the tree-protectors provided for under the Act, but the weather turned cold, and the examination could not be made.

Q.: What has been your experience in spraying to control the codling moth?

A.: I believe it does something towards killing them. For the last two years we have sprayed late in July or early in August, using white arsenic instead of Paris green. We have used the mixture as strong as half a pound of arsenic to fifty gallons of water. This is much stronger than the prescribed mixture, but I found by experiment that the foliage would stand it. This has been of considerable benefit in ridding our orchards of the moth, and I am hopeful that we shall yet be able to find some powerful insecticide which will keep it under control.

REPORT OF COMMITTEE ON TRANSPORTATION.

By H. W. Dawson, Toronto.

The term transportation is usually accepted to mean the moving of commodities from one point to another. I look upon it has having a wider meaning and scope where fruit is considered. The business of transportation begins with the picking of the fruit. It is at this point that as much intelligence and common sense is required as at any other stage. After picking, comes packing and the package. These subjects will be taken up later, but

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both are necessary to proper transportation. Due care must be taken in the packing whether in basket, box or barrel, and also in conveying the fruit to the railway station or boat landing.

The next stage is when the fruit is delivered to the carrying company, and it is right here that there is room for grave complaint, both as to the manner in which it is handled and as to the time taken in loading and unloading. So long as we put up with it the companies will make no improvement. It is right here that the producer and shipper should join hands, and insist on getting better service from the transportation companies. I have seen cars of fruit that should have been in the market early in the morning, side-tracked for all through freight to pass. The probabilities are that it would not reach the market until the day's sales were over. You know what effect that would have on its quality, and consequently on the price that would be obtained for it, because most of the fruit is conveyed in cars not specially built for the purpose, and when the weather is warm, such delay results in great loss to the grower and to the shipper.

The next phase of the subject is the cost of transportation. There is room for grave complaint there also. Fruit is no longer a luxury, and should be placed on a level with other food commodities. But fruit is discriminated against in the matter of rates, while they do not give you any better service, and in some cases not as good. A year ago at this convention I presented some facts, showing that much higher rates are charged on apples than are charged on flour. I have been trying ever since to find out the reason for this, but have not succeeded. The railways say that fruit requires more care in handling, but it frequently receives less care. Neither can it be placed in a special class by itself as a luxury. The day for that has passed, and it has now become an article of diet.

But high as the rates are, I see that there is now some talk of the railways increasing them. If this increase is made, it will no doubt apply to fruit as well as to other classes of freight. For my own part I do not see any reason for this increase, as the railways are already paying dividends on watered stock.

Another grievance we have in connection with transportation companies is that our business does not receive the careful attention it should receive. The railways seem to care nothing about the local trade, and it is impossible to keep track of fruit cars. If I have a car of berries coming, say, from California, I can tell at any hour exactly where that car is, and know to an hour when it will arrive. If, on the other hand, I have a car coming from Grimsby, I cannot tell whether it will come to-day, to-morrow, or the day after.

How are we to improve our condition ? I would suggest that a suitable resolution be passed by this Association, and that copies be sent to the express and carrying companies, and to the Chairman of the Association that has the classification of railroad rates. A copy should also be forwarded to the Chairman of the Railway Committee in the House of Commons. But more than this should be done. A resolution should be adopted calling for the appointment of a Railway Commission to enquire into all these grievances, and, further, the Commission should have power to give publicity to its findings. The Interstate Commission was given this power in the United States, and the mere publication in official form of the cause of grievances has been found an effective means of securing their remedying in that country.

Mr. W. H. Bunting : I heartily agree with the suggestion that such a resolution should be passed, and especially that the proposed commission

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be authorized to give publicity to the grounds for complaint. There can be no doubt that some of the complaints we hear from time to time are well taken; others, perhaps, are not. By bringing them before a body of men able to judge and sift out the real grievances from the unreal, it seems to me that great good would be done. I beg, therefore, to move the following resolution:

"That this Association believes freight rates will not be placed upon an equitable basis until a Railway Commission is appointed, the duty of which shall be to go from point to point, hear complaints in regard to grievances which exist, and publish quarterly or semi-annual reports, setting forth the facts brought out; and that delegates be appointed from this Association, in co-operation with the delegates from the Farmers' Association and delegates from other organizations, to wait upon the Government before the forthcoming session of Parliament and urge the appointment of a Railway Commission."

Mr. L. Woolverton: I am very glad to second the resolution. Another grievance I could mention is the charging of different rates on different fruits. This summer in shipping cars of apples to Montreal I found that if I included a few pears, I had the rate on the whole car load greatly raised. This is very unfair indeed.

Q.: Even in the same kind of packages?

Mr. Woolverton: Yes, in the same packages. I believe it is claimed that because pears will yield more money they will stand more freight, but there is very little difference between the markt price of pears and apples now.

Mr. Fraser, Leamington: I sent a car of melons to Toronto last fall during the time of the fair. The railway companies claimed that sufficient freight had not been paid, removed the car from the point of delivery, and delivery did not take place until the Fair was over.

Mr. Jas. Muir, Port Elgin: It is too often the case that cars cannot be procured within a reasonable time. There have been times when I have had a load of fruit to ship, and have made application to the railway daily for ten days for a car to convey it to market, but they have paid no attention whatever to my application.

Mr. Johnston, Leamington: This question is a very important one to us in South Essex. It is often a doubtful question with us whether we shall receive a cheque in return for a fruit shipment or a bill for further freight charges.

Mr. F. Metcalf, Blyth: Packages of fruit are very often robbed in transit. But we cannot afford to hold our fruit while the matter is being investigated, which is often a difficult matter to accomplish, so we bear the loss.

Mr. Wm. Fisher: I think the conditions of carriage is often a more important matter than the rates charged. The neglect in this respect is often almost criminal. In August a steamship company, through its representative, issued a circular saying that splendid opportunity would be afforded for shipping tender fruits on one of their vessels. I sent a carload of tender fruit by that ship. At the end of the voyage the thermographic chart showed that the temperature of the chamber had ranged from 68 degrees to 30 degrees, and it was quite evident that the fruit had been both choked and frozen.

Mr. A. McNeill: I am thoroughly in earnest upon this question, as it is the one subject before all others that is at the basis of our fruit industry. Whatever can be done should be done immediately. I should like to add one or two facts to those already stated. We need not take time in discussing railroad rates; we know that we are in this matter discriminated against as Canadians in favor of Americans, and we are discriminated against as

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fruit growers as well. Other interests in this country secure better rates than we do on our products. Then there is the question of accommodation. This I consider is quite as important, and should come within the scope of inquiry of the Commission that has been suggested. At Hensall, some four weeks ago, I saw three or four cars of apples standing outside the station exposed to the full force of an afternoon's rain. The loss on that one shipment, as a result of this exposure, would be sufficient to provide a shed at that station which for half a century would have provided storage room. The same thing occurred at station after station. There has been enough lost on apples alone in this one season to have met the cost of providing shed room for fruit and everything else. Then there is the matter of the supervision of refrigerator cars. There is no supervision over them. No one knows whether they are iced or not. Then, as Mr. Dawson has said, on the other side of the line you can tell just where a car is from day to day, and you can see that the refrigerator service is kept up all along the line. Here, after a car has been despatched, neither the railway company nor anyone else can tell where it is. Do not address a written communication to Ottawa, but send a man of weight and influence from this Association. Never mind the expense ; you will never spend money half as well.

Mr. D. D. Wilson, Seaforth : I should like to emphasize what has been said by Mr. McNeill. I believe that the method proposed will have some effect in dealing with this most important subject. We must insist on having a Commission appointed for the purpose of setting these matters right that have been wrong for so many years. I think a committee should be appointed to put the matter in shape to lay before the Government. A written communication will have no effect. That committee should not only collect facts in reference to this matter, but should associate them with every other organization that is intersted in transportation. The conditions were never more favorable than they are now for securing what we want. One of the great railway companies is about to come before Parliament and ask for a charter to build a transcontinental road. They will ask for certain privileges, and the Government will be in a position to say to them that unless you comply with the demands of the people we cannot grant you those privileges.

The President : We have with us the Secretary of the Farmers' Association. That Association has been organized for the purpose of uniting all agricultural interests, and I understand it has already taken some steps in reference to the matter we are not considering.

Mr. W. L. Smith, Secretary Farmers' Association : It is intended to follow that action with the sending of a deputation to Ottawa to ask for the appointment of a Railway Commission. Other bodies representing organized agriculture will be asked to appoint delegates for the purpose of making a joint representation in the matter. There is reason to believe that the Dairymen's Associations and the Dominion Cattle Dealers' Association will take part in the effort to be made, and I have no doubt that Mr. Creelman will secure the co-operation of the Farmers' Institutes. The support of the City Councils should also be solicited. If a joint deputation of the nature suggested is sent to Ottawa, I feel assured that a Railway Commission will be appointed, and that more equitable rates will be secured. Then, if the fruit men increase the value of the output of their orchards, as Mr. James suggests, by fifteen cents per tree, all this increase and more will not be absorbed by the carrying companies.

The resolution was then put to the meeting and adopted unanimously.

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Wm. Rickard, M.P.P.: You should appoint a good strong committee, because it is very important work that they have to do; it is all-important. We produce the best of fruit, and lose it, or the profits from it, entirely on account of the methods of transportation and the high freight charges.

It was moved by Mr. McNeill, seconded by Mr. Fraser: That Messrs. Caston, Bunting, Wilson, and Dawson be appointed a committee to co-operate with the committees appointed by other Associations to urge upon the Government at Ottawa the necessity for appointing a Railway Commission. Carried.

THE GRADING AND PACKING OF APPLES.

By Alex. McNeill, Acting Chief, Fruit Division, Ottawa.

In the grading of apples we are taking six things into consideration: the form, the size, the color, freedom from blemish, the flavor, and keeping qualities. Some of these elements are more important than others. Freedom from blemish is, perhaps, the most important; size and color are of very great importance in some cases and not so much in others. The matter of form, while it is important, is of somewhat less importance. A perfect apple should be free from scab, worm holes, or bruised or broken skin. For commercial purposes flavor is indicated by the name of the variety. Under the present Fruit Marks Act we are required to put the name of the variety and the grade of the fruit on the package. By placing the name on the package, we grade the contents to a large extent as to flavor and keeping quality. For instance, when we see "Red Astrachan," we know that we have an apple of fair keeping qualities. When we see "Ben Davis," we know that we have first-rate keeping qualities. So that keeping qualities and flavor are indicated by the name of the variety.

This leaves us four points to consider—size, color, form, and freedom from blemish. You cannot form a grade upon any of these taken separately. We cannot grade from color alone, although it is an important point. For a commercial system of grading, therefore, we endeavor to unite these four qualities as nearly as we may in order to form a grade, and apples that are not deficient in these respects—are free from blemish, or fairly good color, and are not too small for the variety are classified as No. 1. Anything can, under the law as it now stands, be classed as No. 2. Is that system of grading too difficult for the average grower? I think not.

The question has arisen as to whether a grade for No. 2 apples is desirable. We know that, commercially, apples grade as No. 2 that are slightly smaller in size, etc. There is a somewhat wide demand for a definition of a No. 2 apple. I do not know of any definition that is not free from objection. Possibly the Association can be of assistance in this matter.

When we use the term "free from blemish," we mean blemish that would cause appreciable waste. A slight dent is a blemish, but I do not think that any inspector would consider that it would disqualify a first-class apple, so long as it is not a breaking of the skin and will not affect the keeping qualities. Anything that causes appreciable waste is a real blemish, and must be considered in grading. As a means of preventing bruising, I would suggest clipping the stems, so that these may not turn over and press on the sides of the apple.

For the last six or eight years there has been considerable discussion in regard to packages. With regard to apples, the time has not yet arrived when

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we can do away with the old-time barrel. For many years to come it will continue to be the package in which the bulk of our apples will be shipped. Nevertheless, I do not think the barrel trade will increase as rapidly as the box trade. That form of package is becoming more popular in the Old Country. It has several advantages ; apples will keep longer in a box than they will in a barrel, especially in warm weather. Then the box shows off fine grades to better advantage, and the larger specimens carry more safely and pack more economically. The box is also a convenient form of package for taking into the home of the purchaser.

In putting up barrel fruit, the Fruit Marks Act must be strictly observed. It provides that the package of whatever kind must be packed so that the surface layer fairly represents the fruit all the way through. Even this year we have had a few examples of the old-time practice of facing the package with the best specimens, and using the inferior fruit as a filler. But I am pleased to be able to make this declaration, that this year, after inspecting 10,000 barrels of fruit, we found a very small portion that were not packed in accordance with the provisions of the Act. I went specially to Montreal on one occasion for the purpose of seeing how the Act was being observed. While there I saw 30 carloads examined, and out of the contents of all those cars not more, I think, than two samples called for positive action by the inspectors. I do not think there is any harm in telling the truth once in a while even in a matter of this kind. What has been the result of this? It is that our Canadian apple trade in England has been placed upon a better basis than ever before. We have received a number of letters from dealers on the other side stating that for the first time in the history of the trade they could depend upon the quality of the fruit being the same all the way through from start to finish. We get these reports continually at the Department, not only from England and Scotland, but from Ireland and Germany as well. I thought it would take two or three years to wipe out the disgrace of the old method of packing ; and it is a big thing to be able to report as having been accomplished in one year. As to results in the future, I will predict that this grading of our apples will result in sales being made in this country for the British market on the grade mark alone. One dealer said to me personally that next year he would be willing to buy all the No. 1 apples packed in Ontario. He has seen that 98 out of the 100 barrels of apples that have been placed on the market this season as No. 1 have turned out true to grade, and he is now willing to purchase on the strength of the grading without seeing the apples. If this is continued for another year, fruit dealers will have no hesitation in writing over here and saying, "I will take all your No. 1 apples at a fixed price." Such a system, if it became general, would mean that instead of taking all the risks of consigning to a market thousands of miles away, you will be able to sell your apples right in the orchard.

In packing, pay special attention to the racking of the barrel ; this should be thorough. If there is anything lacking in the present methods of packing it is in proper racking of the barrel. By this I mean the gentle shaking of the barrel as it is being filled. The inspectors at Montreal report that more apples are spoiled through over pressing than under pressing. There is a tendency of late years to over press apples. This requires nice discrimination and proper supervision. Open a barrel occasionally after it has been packed just to observe the condition in this respect. I think every dealer should test the work of his help by opening a certain number of barrels in every shipment.

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I believe the time is coming when fancy apples will be packed altogether in boxes, and the poorer grades in barrels. To put the box trade on a satisfactory basis, we should have a standard size, and I think it would be well for the Association to discuss this question. An assortment of sizes coming from one country is confusing to the buyer. If our boxes were uniform in size, we should make an impression on the market much quicker. Last season 250,000 boxes were received in Great Britain, and 200,000 of these came from the United States, and were of the Californian size. Why should we not adopt that size?

As to material, the Canadian box has unyielding sides, ends and lids. Their box is made of tough, thin wood, the springiness of which enables the Californians to pack their boxes tight. They claim that their packages never get slack.

Q.: What quantity does the Canadian box hold?

A.: Between 45 and 50 pounds.

The President: I have been using a fifty-pound box. They call it a bushel box.

George E. Fisher, Freeman: A marked improvement in packing has no doubt resulted from this Act, but it has resulted principally from section 7, which requires the fruit on the face of the package to fairly represent the contents, and from sub-section "a" of section 4, which provides for the packer's name appearing on the package. This is not too much to expect from a farmer, who can readily understand the difference between honest and fraudulent packing, and this feature of the Act should be upheld.

When we come to the amendment of last session, which requires compulsory grading, I wish to be understood as giving that my unqualified condemnation, and to go on record to that effect.

Sub-section c of section 4 provides for arbitrary grading, and to my mind is an unwarranted interference with the fruit industry and with the rights of citizens. Parties packing fruit are by that section required to grade to a specified standard, and to take the responsibility of branding their packages to these grades, which no other class is compelled to do. There is a responsibility put upon the poor farmer that no Government would think of putting on any other class, and which no other class of the community would tolerate. Fruit differs so in different sections, and people's ideas differ as to what should constitute the several grades, that one man's No. 2 will be better than another man's No. 1. Uniformity cannot be got in this way. Inspectors themselves cannot do it. It cannot be done by any class of men; it is an impossibility. Yet under section 8 of this Act a farmer is fined if he does not judge and brand his own fruit and his judgment does not coincide with that of the Inspector. Why should the fruit grower and farmer be saddled with a responsibility which is not only unprecedented but impossible to perform? It seriously hampers trade by terrorizing the farmer, who rather than take the risk of marking his packages and incurring the odium of being fined, disposes of his fruit at a low price or leaves it to rot in the orchard. The fruit growers of the country are thousands of dollars worse off this year because of this clause.

A Member: No; no.

Mr. Fisher: They are, undoubtedly. Lots of my apples went to the evaporator because I was afraid to take the responsibility of grading them.

Mr. McNeill: That's where they should have gone.

Mr. Fisher: We have about us on all sides evidences of the injustice the Act is working, and also letters from the British markets explaining that the marks have no meaning there, and that fruit is sold strictly on its

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merits. Being the marks of the owner, who is an interested party, these marks would not be considered in any court, and would consequently have no commercial value in case of a dispute between the seller and the buyer. There should be no compulsory grade marks. The responsibility for grades should not rest upon the farmers, but upon the inspectors, who should be available to do inspection work and issue certificates when required, as in other lines of business. It should be entirely optional with a shipper whether he has his fruit graded to standard or not, and if it be so graded, it should be merely to serve his own purposes ; there should be no compulsory marking of the grade. Millions of bushels of grain change hands without inspection ; and when it is inspected the owner is not required to indicate the quality, but the inspector makes his examination and gives his certificate. There should be clearly expressed definitions of the three grades of apples and pears for the use of inspectors only. Section 14 provides for summary conviction and imprisonment, and places the case under the criminal code. It demands a deposit of costs in case of an appeal, and denies the right of trial by jury in a criminal case. Who ever heard of a criminal being denied the right of trial by his peers or of being required to put up costs ? In my judgment the clause should be repealed.

Elmer Lick, Oshawa : I do not believe that parties who can trust their own judgment as to what constitutes a No. 1 apple have any complaint to make against the Act. If a farmer knows what a No. 1 apple is, he will put himself in the position of an inspector and will not go far wrong. Mr. Fisher appears to be a little afraid to trust the judgment of those packing the apples. Very large shipments have been made from the Brighton district, and there has been no difficulty there. They realized that this year a large proportion of the fruit was second quality, and marked it accordingly. The question is, Shall we have marks that mean anything in the British market ? They have not meant anything in the past ; they do mean something to-day. The greater portion of the apples shipped in former years bore the mark " X X X." Where the apples really were No. 1, the shipper's own name was added ; where they were not, the X X X was still put on, but an employee's name was added instead of the exporter's. These fraudulent No. 1 apples come into competition with the genuine No. 1 fruit of the honest shipper. This year No. 1 apples have been No. 1, and as a result the fruit brought from 50 to 75 cents per barrel more in the British market. Even if it does work a little hardship, is it not better that we should put up with it than go back to the old system ? If you have inferior apples, had you not better mark them accordingly and wait till you get No. 1's ?

Mr. McNeill : Or work till you get No. 1's ?

Mr. Lick : That is it.

A. H. Pettit : I wish to say that I have been an advocate of the Inspection Act from the beginning. To-day I feel that there is a great deal of complaint throughout the country in regard to it. If there is a body of men who feel that the Act is oppressive, I feel that they should be given an opportunity to express their views. A committee should be appointed to consider any amendments that may be deemed necessary. Many orchards in our part of the country this season have scarcely contained a barrel of fruit that could properly be marked No. 1. If fruit growers consider the Act too stringent, let them express themselves as to the way in which it should be amended.

F. G. H. Pattison, Grimsby : The Act has caused considerable injustice as between growers and dealers. The growers contracted early in the season at a certain price for No. 1's and a certain price for No. 2's. The growers

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understanding in making the sale was that No. 1 meant the same as in former years ; the dealer understood it to mean No. 1 as defined by the Act. As a result the grower was compelled to accept No. 2 prices for what he considered to be No. 1 fruit. The buyer might also reject fruit altogether, while the apples lay under the trees after picking and were still at the grower's risk, if there happened to be a fall in prices, on the ground that they were not No. 1.

Robert Thompson, St. Catharines : I think it is possible in a case of that kind that the fruit might, owing to the development of a fungous condition, become worse in the meantime. As a grower, I should have no hesitation in making the buyer take as No. 1 all the fruit that would come under that class that he had contracted for. I believe the Act is all right ; but we should have the privilege of calling in the inspector to grade our fruit before selling, so that we could sell on the grade.

A. E. Sherrington : There is no doubt that the law caused serious loss this season throughout this section, because farmers were afraid to pack for fear they should make a mistake in the grading and be fined for it. I think apples should be inspected at the point of shipment, and marked by the inspector before they are shipped. Under present conditions, if the buyer complained of the quality of the fruit on arrival, and refused to pay the price agreed upon, we have no redress. If the apples were inspected and marked by the inspector before shipment, payment could be enforced.

A. W. Peart : I think it would be of interest to know at whose instigation the amendment quoted by Mr. Fisher was incorporated in the Act. I think that the Act as it stood in 1901 was perfectly satisfactory, and in the interest of honest packing. No other industry is required by law to place arbitrary marks on its products to indicate the grade. Why are fruit growers discriminated against ?

Wm. Rickard, M.P.P.: We all know that Canadian apples were given a bad name in the British market for the reason that, under an assumed name, shippers sent over inferior fruit marked as first grade. Some legislation was, therefore, necessary not only in the interest of the shipper, but in the interest of a far more numerous class, the grower of apples. Notwithstanding what has been said here this afternoon, I fail to discover what real objection there is to the Act. I think the grade mark counts for something in the English market. I claimed at the time the Act was passed that it would do away with nine-tenths of the evils complained of. It has been a very hard matter in the East this season to put up No. 1 apples at all. The only thing to be done was to mark them No. 2, which they were. I shipped 500 barrels to Glasgow, all marked No. 2.

The President : I was one of the committee that framed the original Act. We found it an extremely difficult matter to deal with ; but we have the testimony of the Inspector that it is working to the good of the trade, and I do not think we should be in too great haste to amend it without giving it a fair test.

A Member : I do not think that many object to the original Act ; it is to the marking of the grade that objection is made.

On the motion of Mr. A. H. Pettit, seconded by Mr. Woolverton, the President was authorized to appoint a committee to present to the meeting any amendments they wished to suggest.

The President thereupon named the following : A. H. Pettit, L. Woolverton. A. McNeill, Geo. E. Fisher, Wm. Rickard, and H. W. Dawson.

After discussing the matter for some time, the committee failed to bring in any report.

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MARKETS AND MARKETING.

By D. J. McKinnon, Grimsby.

I entirely approve of the suggestion that has been made this afternoon that we should have legislation to define the size of the apple box. It is necessary that we should sell a great deal of our fruit by correspondence and by telegram, and in order to do that to advantage we should have something definite to offer for sale, something of recognized size and quality all over the country; something that cannot be a subject of dispute between buyer and seller. We should also have a standard for grading, so that the buyer may know what to expect. There are requisites to successful marketing. When I speak of marketing, I do not refer to marketing the crop in the orchard; nor do I mean merely picking the fruit and shipping it to a commission merchant to dispose of. For the man who takes no care in the culture of his fruit, and who gives no attention to grading and packing, I would recommend that way of marketing. Get your fruit together; bundle it somehow into barrels, boxes or baskets, it makes little difference which, and send it to the nearest commission house. My remarks will apply to those who wish to know how to make the most out of their fruit. For such I lay down two requisites: First, that they have something definite to offer as to size, and, second, as to quality.

It is quite easy for the individual grower to make a grade for himself. It is easy for him to say that the ordinary peach basket holds three layers of fruit, and that they run about so many to the basket; that the small basket holds two layers, and averages so many. That is generally satisfactory to the buyer. The quality is more difficult to define, however; but he may say that the fruit is free from spots, rot, or gum. Define your fruit as nearly as possible, and you will, generally speaking, get a higher price for it than if it is not defined.

There are various ways of marketing besides those I have mentioned. A very good plan for those living near a city is to dispose of the fruit on the market to the individual buyers, or to carry it around and sell it to private customers. The next plan is to sell to a jobber in your neighborhood. My experience in selling to jobbers is that in nine cases out of ten I realize more than if I put the fruit on the commission market. Besides getting a better price you also have the satisfaction of helping your neighbors in a business way.

Another system of marketing for large growers is to get retail customers all over the country—retail grocers and others. This is more profitable, if the business is conducted right, than selling to jobbers in the neighborhood. It, however, necessitates taking a great deal of trouble, and it is not worth worth while unless you go into it in a large scale. It will not pay in a small way, and will pay very few growers unless they buy fruit from neighboring fruit growers to fill up.

With regard to the commission market, I may be prejudiced, but with me it has always been an unsatisfactory method; although once in a while I get a fair price. In the first place you have to pay double freight—freight, say, to Toronto, and then on to its destination. In addition to this there is the commission of 10 per cent. This system is unsatisfactory in another respect: Last summer I found a little store keeper at an outside point selling fruit at a very much lower price than I could afford to accept on board cars at Grimsby. I asked him how he could do this, and he replied that he had an arrangement with a commission man under which he was

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to charge a certain price for the fruit if he could get it, but if he could not get that price, he was to sell it for whatever it would realize, take a fair profit for his trouble, and send the balance to the commission man from whom he had received the fruit. I heard two retailers in one town make a similar statement, and they were buying from two different commission merchants. That is a serious state of affairs. It means that in some cases we pay a commission to the dealer to whom we consign in the first place, and then he pays a second commission to the retailer. The sooner the system is changed, and the commission men become jobbers and buy fruit from the producer at a fixed price, the sooner will the business be on a satisfactory basis.

I have a suggestion to make, not my own, but something that is being spoken of by fruit growers all over the country. It is that we should organize ourselves into Associations and build cold storage warehouses and packing houses, and secure first-class men to superintend them. First-class packers should be employed to take the fruit as it is brought in and give it its correct grading. The superintendent would give a receipt for the fruit according to its grade, and then sell the product of the whole Association to the best advantage, each grower receiving a fair return according to the quality and quantity of his product. This is the plan that is being pursued in California in regard to oranges and other fruit. It may be more difficult, however, to carry it out in this country with more perishable fruits.

As to the foreign market, I agree with the theory that the box is the right package for that market. I agree that the fruit should be of standard quality; but I would go further, and declare that no apples except those of No. 1 quality should be exported in boxes. That may be considered arbitrary. One grower will say, Why should I not ship third quality apples in boxes if I want to? Simply because the greatest good to the greatest number must rule. For that reason you must not be allowed to spoil the market for your neighbor's No. 1 fruit. I am led to believe that such a plan, if adopted, would be very profitable indeed for us.

Mr. A. W. Peart, Burlington: In reference to co-operative associations, I may say that there is already one in operation in the Burlington district which is giving excellent satisfaction to all those connected with it. In regard to the important question of markets and marketing, no matter how skilful we may be in fruit culture, unless we handle our fruit in a business way we cannot expect to get satisfactory results. In a general way we may divide the market into two classes, the home market and the foreign market. It would seem that the foreign market is capable of extension. One of our members recently shipped fruit in cold storage to Cape Town, and the result will, no doubt, depend on the efficiency of the cold storage service on board ship. My experience in the export business has been large, and my experience with the British market is that no matter how great a crop of apples we may have, if we send No. 1 apples there we can always get a No. 1 price. But during a year like this, when so many apples are going forward, it does not pay to send No. 2's, and for these we should endeavor to find a market at home. I believe it is best to send only choice apples in boxes; but I would not use boxes for the home market. There is always a good market for pears in Great Britain if we could only be assured of efficient cold storage; but at the present time we have no assurance that they will land in good condition.

I made an experimental shipment of tomatoes to the Old Country, thinking there might be a market for them there. I sent the variety known as "Honor Bright." It is a late, medium-sized, smooth, firm variety. I clipped the tomatoes with the scissors, leaving half an inch of stem, wrap-

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ped them in tissue paper, and placed excelsior between the layers. Three years ago a similar shipment landed in good condition, and brought 6s. a box. Last year nothing was realized, as they landed in bad condition. This I rather expected, as there was a slight frost previous to picking. This year the shipment arrived in good shape, and sold at 4s. If we could average 5s a box there would be good money in it. I also tried shipping some Rogers grapes to Great Britain, but without success. I found they arrived in a shelled condition. I do not know whether it would be of any advantage to dip the end of the stems in wax to prevent evaporation. I have also shipped plums, but obtained no better prices than we receive here.

Wm. Rickard, M. P. P.: With regard to the boxing of apples, I think that a committee should be appointed to interview the Government on this matter, with a view to providing a uniform box, and also that none but No. 1 apples should be shipped to the Old Country in boxes.

M. Pettit: I think the suggestion is a good one. If nothing but No. 1 apples are shipped in boxes, it will tend wonderfully to increase this trade.

The President: Do you propose to bar anybody from shipping No. 2's in boxes.

Mr. Rickard: Yes; the box should be kept exclusively for first-class apples.

A. McNeill: The Chief of the Fruit Department, who is investigating the markets in England at the present time, wrote a letter stating that one of the serious dangers threatening the box trade was the inferior fruit that was being shipped in boxes.

The President: I do not think we should be debarred from shipping our smaller apples in boxes.

Mr. Rickard: The smaller apples should go into barrels. That is where the huckster in the Old Country wants them.

A. H. Pettit: Our great Northwest market will exceed the British market in a few years, and whatever we do, it should cover our own country, as well as the export trade.

R. M. Palmer, British Columbia: You must remember that you are asking legislation for the whole Dominion, and not merely for Ontario. In behalf of the British Columbia fruit growers, I may say that we wish to have a standard box just as much as you do, but we do not want to be limited to putting our No. 1 apples in those boxes.

A Member: We require boxes for shipping other fruits besides apples. I think that the committee should also consider this.

A. H. Pettit: We are using a case that goes a little more than three to the barrel. The British market prefers the 40-pound package to the 50. As regards the lightness of the package, the California boxes are made of a tougher, stronger, and springy material, which we cannot obtain. Our boxes must have substance in order to have the necessary strength. They are already costing us too much money. The ends are dovetailed, which I think too delicate. In the near future all our No. 1 stuff will have to go forward in boxes.

Mr. Sherrington: I think it would be well for the Association to adopt a uniform size of box.

Mr. Rickard: The question of securing the right kind of barrel is also a very important one. I have seen barrels this year that I would not have if they were given me—the barrel made of light stuff, with the light hoop and a big bilge. You may rack such a barrel as much as you like, and it will never carry tight. I want a firm package with a good stave and a good hoop, and without much bilge. You can pack your apples tight in such a barrel, and they will carry tight on board the steamship.

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The following committee was appointed: Messrs. A. H. Pettit, L. Woolverton, Alex. McNeill, George E. Fisher, A. W. Peart, and R. M. Palmer.

REPORT OF COMMITTEE ON BOXES.

The Committee on Boxes submitted the following resolution: "That this Committee recommends the use, so far as possible, of the California package for fruit."

A. M. Pettit: I beg to move the adoption of that resolution. Mr. W. Rickard seconded, and the motion was carried.

D. J. McKinnon moved, seconded by Mr. Rickard: That the Minister of Agriculture for Canada be memoralized to enforce legislation that no apples of lower grade than No. 1 shall be sold in boxes printed in red or reddish colors.

Mr. McKinnon: This resolution does not meet my views, nor the views of those who maintain that no apples other than No. 1's should be shipped in boxes, but it will permit British Columbia growers, who have no barrels, to ship No. 2's in boxes, provided the boxes are marked in black.

Mr. Rickard: I do not think we should submit any recommendation until we know exactly what we want. In my opinion, if we are going to make a reputation for Canadian box apples, we should ship nothing but No. 1's in boxes. I do not know exactly how to deal with British Columbia, but Mr. McKinnon thinks that a distinction in the color of the marks will answer.

A. E. Sherrington: I move in amendment, that the whole box question shall stand over till next season. This motion was seconded by Mr. Harkness, and carried.

SPRAYING APPLE TREES.

By Joseph Tweddle, Fruitland.

It is proper attention to the details of the work that makes the difference between success and failure in orchard spraying. No great results are to be expected unless we have the conditions right to start with. It is of little use spraying an orchard that has not been pruned for three or four years, as the growth will be too thick to admit of the trees being sprayed in a thorough manner. The orchard must, therefore, be given a thorough pruning before commencing to spray. This thinning and pruning is also necessary in order to give the trees the light and air necessary for the proper development of the fruit. In addition to proper pruning, it is essential to have the soil conditions right in order to get fruit that is perfectly developed as regards size, color, and flavor. When these things have been attended to, we may proceed to treat the tree, fruit and foliage for the destruction of injurious insects and fungous growths by spraying.

In the work of spraying there are also a lot of details that must be attended to, in order to secure the best results. If Bordeaux mixture is to be used, it is essential that it should be properly prepared.

In speaking to you as commercial growers, I would not go into the details of making the ordinary Bordeaux mixture. I may say, however, that the most common error made is in bringing together the dissolved lime and bluestone before adding the full quantity of water. If this is done, chemical action results which renders the mixture altogether useless as a fungicide. In order to avoid this, we must add half the necessary water to the dissolved

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lime, and the remaining half of the water to the dissolved bluestone, and then combine the two. This plan will give a perfect Bordeaux mixture and an efficient fungicide. We have obtained splendid results by a more convenient process, namely, by diluting our lime in enough water to strain it through a fifty to the inch brass wire strainer, and filling the spray barrel nearly full of the lime and water, and then adding our dissolved bluestone. It is very important to keep the mixture well agitated just before and while spraying. I do not consider that there is any necessity for spraying in winter time, but we start operations as soon as there is foliage to protect. The trees should be given two sprayings, if possible, before the bloom starts. Directly the bloom is off the trees we go at it with all hands and three pumps, so as to get over the orchards within a week after the blossoms drop. The apple curculio does its work at that particular time, causing many rough, uneven specimens, and the only way to prevent it from stinging the fruit is to get promptly to work. For this work we prefer white arsenic to Paris green for mixing with Bordeaux; but it must be properly prepared, or it will burn the foliage. We use two pounds of fresh lime to one pound of arsenic, and boil in two gallons of water for forty-five minutes, using four quarts of this to 40 gallons Bordeaux. With this mixture we cleaned the curculio right out this year (we use Vermorell nozzles, 20 to the inch), and I can recommend it to careful people as being very much better than Paris green.

I think it is very poor practice to attempt to spray against the wind. We always spray on the windward side of the trees. After we have sprayed one side, we wait until the wind changes, which usually occurs in from one to three days, making the circuit in a week, and then spray the other side. The only failures we have had were when the winds were very variable, and we were in a hurry to finish up the work, in cases of immediate danger. If the season is particularly favorable to the development of the codling moth, we usually keep right at it, giving an application every two or three weeks. About the 15th of June, we usually manage to catch the bulk of the first brood, and the second brood about the middle of August. We also use the bandages.

As to the treatment of scab, I may say that 48 hours' rain, with high temperature, will germinate the spores of this fungus, and bring it on so fast that it will get rooted in the leaf or the apple before the foliage dries. You will therefore understand how important it is to have the fungicide on the trees beforehand (fore-sprayed is fore-armed), but if not on before, get your pumps going just as soon as possible when this condition occurs. I do not agree with those who say that the Bordeaux mixture will not stay on the trees when the rain comes. I have found foliage covered with the mixture at the end of the season, after the rains of all summer.

The codling moth is very destructive in our district. It will sometimes thin the fruit to such an extent that we do not get half a crop. I understand that arsenate of lead, with the Bordeaux, is coming into use as a remedy for this pest, and that it is perfectly harmless to the foliage, and does not easily wash off.

The President: I think that Paris green washes off, but the Bordeaux mixture does not wash off so easily.

Mr. Tweddle: I do not see how that can be when the poison is mixed with the Bordeaux. I should like to say something as to what returns a properly managed orchard will give. I have been shipping apples to Germany this season, and have just received the returns. My Greenings netted me $3 per barrel; Baldwins, $3.12, and Spies, $3.82. From four and a half acres of orchard, which I rented at $65 per year, we packed 800 bbls., 80 per cent.

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No. 1, for which I netted $2,000 for my apples this year, f.o.b. here. From another orchard, covering 25 acres, and rented for $100 a year, we packed 1,150 bbls., and I realized $3,000. The Baldwins gave me 95 per cent. of No. 1 fruit, ard the Greenings 80 per cent. But, of course, I did the work necessary to produce the finest of fruit. My neighbors begged me to take their apples at 75c to $1.00 per bbl., but they were scabby, and I would not take them if I got them for nothing, as I would not ship them.

In making statements of such crops and prices before the public, I think it is right for me to properly qualify them, or they may appear extreme and misleading. Let me say that the past season was an ideal one for apple growing, excepting for the attack of scab. With thorough pruning and spraying, perfect fruit was easy to secure. The season was cool and moist, causing perfect fruit, and at the same time it was unfavorable to the propagation of insect life; hence, where general conditions were nearly right, the whole crop set and came to perfection, for in such cases no June drop occurred.

In the 4½ acre orchard, yielding 800 barrels, we have grown winter cover-crops of rye, and plowed them down in the spring, and several pruned each year. This was the fourth year of my lease. In the 25-acre orchard, the yield of 1,150 barrels was only one-quarter of the amount per acre produced in the 4½-acre orchard. The difference was caused by this orchard being badly injured for years before I took it, in the spring of 1901, by canker worm and general neglect, which allowed me only two seasons to prune it of its tangled masses of brush and destroy the worms; also to work up the soil, which I did not get completed, a part of it being still in sod. Two years hence this orchard, under similar climatic conditions, ideal culture, and general care, should yield from 3,000 to 4,000 barrels of choice apples.

In regard to the high prices, I may say that just as favorable conditions prevailed. Prime, clean stock was very scarce, and with a record of five years' honest packing, the consignee was enabled to secure me the highest prices going. In many cases the fruit was practically sold before arrival. It takes time and patience to work up to these results, but it pays, and pays handsomely.

THE TRADE IN FANCY FRUITS.

By L. Woolverton, Grimsby, Secretary Fruit Experiment Stations of Ontario.

I beg leave to leave out the word "export" in this connection, and deal with the business in general. I have long been convinced that the hope of the fruit growers is in the production and sale of a superior article. The markets are glutted with poor stock in apples to-day, but there are always people who will pay a good price for high grade fruit.

The production of such fruit is first in importance, and will only be attained by the few men who are willing to fight scale, insects, and fungous so faithfully as to win the victory over them; to manure and cultivate his trees till they are full of vitality and vigor; to prune and thin until every bud, on every branch, left to produce fruit, shall yield the best and finest grade.

If every fruit grower would do this, perhaps the prices would come down; but fortunately for the few, only the few will ever do this, and those few will eventually reap a rich harvest.

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For years I have been putting up my largest and finest peaches in the six-quart basket, and ordinary grades in the twelve-quart, and even on the public auction market the six-quart basket of choice fruit sold for about the same money as the twelve-quart ordinary grade.

I found the same with cherries, and have received every year an average of 50c per six-quart basket of Mexel cherries, no matter how cheap other varieties were.

Even in Astrachan apples, in Toronto, the nearest large market, I have shipped regularly the largest and finest in baskets, and had them sold at from 30 to 40 cents, when common stock brought only 15 or 20 cents.

I began some ten years ago to apply the same practice to apples, putting up the finest in bushel boxes, and forwarded them to Edinburgh, to Antwerp, and even to Sydney, in New South Wales, with most encouraging results, the finest netting me about $1 a bushel. And since we have our grades settled upon, I have been able to contract for my Spys with one Old Country buyer at $1 per box f.o.b. Grimsby.

Since cold storage facilities have come about, I have, with others, taken advantage of it for all the tender fruits, and though I have only failure to report in peaches and tomatoes, I have fair success to report in Astrachan and Duchess apples, and Bartlett pears, the latter reaching 7s 6d for the best for half-bushel cases in Glasgow market.

A sale of 414 packages of Bartlett pears and King apples in Glasgow market realized prices ranging from 4s to 7s 9d for half bushel of pears, and from 4s 6d to 6s 6d per bushel for apples.

The great difficulty is to secure satisfactory consignees. We have had our sales made by public auction, and now conclude we could do much better could we have had our goods sold by private sale. We are, indeed, credibly informed that the buyers put their heads together, and one bids for all, and then divides the spoil with his fellows. Thus the middleman gets the benefit of all our fancy packing, and we get but too small an advance on ordinary packing.

Several firms in Great Britain offer to handle such fancy packages of choice fruit through travellers, thus placing them by private sale at the best value, and this we believe the ideal plan.

Indeed, it does not matter where we place such stock on sale, in Chicago, Winnipeg, Ottawa, or Toronto; or in England, Germany, or South Africa, if properly sold, it will bring excellent value.

It will be a grand day when we can have co-operative cold storage near home, and send out our fine stock on orders through the year just when it is most wanted.

The size of the box that we ought to use for fancy apples is still unsettled. We began with one 24 x 12 x 12 outside, holding a full bushel, and measuring for storage two cubic feet. Of these about two and one-half equalled a barrel. To make even measurement, we adopted a box 22 x 10½ x 11½, which we reckoned would go three to the barrel; and now we are advised by brokers in Great Britain that a box 21 long x 11 wide x 9 deep inside, measuring four to the barrel, is the box most known in Covent Garden, and on which the price per box is based. The latter box, of which we have a sample here, takes three layers deep of apples instead of four.

An average of four to five shillings a box for one measuring four to a barrel is an excellent price, even for fancy stock, but when you get the same for a box only three or even less to the barrel, you are out of pocket.

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THE ONTARIO FRUIT EXPERIMENT STATIONS.

By L. Woolverton, Secretary.

Nine years ago we planned out the present system of fruit testing stations, so distributed as to cover the whole Province. The object was (1) to test the absolute value of all fruits, and to discourage the cultivation of those that were of least value in the commercial orchards. (2) To test and report upon the real value of new varieties which gave promise of merit, thus helping Ontario fruit growers to avoid wasting their money on useless novelties, and to know which of them really possessed merit. (3) To carefully test the adaptability of the whole list of desirable kinds to the various parts of the Province, and keep fruit growers so informed of the results that they may be guided in planting only such varieties as will succeed in their locality.

Out of these has grown a fourth object, viz., the condensing of all this information into one permanent volume, to be known as "The Fruits of Ontario," which, when completed, shall give reliable descriptions and photographs of all our desirable varieties, and give each planter full information regarding them. With this object in view, the Secretary has planted about eight hundred varieties at Maplehurst, and each of the thirteen experimenters situated in various sections, from Brockville, on the St. Lawrence, to Wabigoon, have planted from three to five hundred varieties each.

All these varieties are now beginning to come into bearing, and notes will be taken of the characteristics both of tree, plant, and fruit, year by year. The work is now beginning to assume vast proportions, and the small amount of $2,600, which has so far been given for this work each year, must soon be largely increased if the full advantage of the work of the various stations is to be made use of for the good of the Ontario fruit grower.

As you are already aware, the work of all the experimenters is directed by the Board of Control, through its Secretary, and the Board is kept thoroughly posted about the actual work and merits of the experimenter, by Prof. Hutt, who makes a tour of inspection each year,and makes a full report to the Board.

Besides this, each experimenter is required to make a yearly report to the Board, before receiving the last half of his yearly grant; and these reports, with that of the Inspector, and the work of the Secretary, who condenses them into uniform shape, and visits the stations for the careful study of the various fruits in their different localities and conditions, altogether form the Annual Report of the Fruit Experiment Stations of Ontario, which must grow each year in value and interest to the fruit growers of Ontario.

PEACHES. By W. W. Hilborn, Leamington.

I consider that the most important part of the experimental work performed by any of us is to give you the information we have gained. That I think can best be done by giving you a list of the varieties I consider most favorable for orchard culture in the district I represent. I have planted about 150 varieties, and of these about 100 have fruited, but not all of them have fruited sufficiently for me to speak definitely concerning them. I have omitted all extra early or clingstone varieties, because in the past too many trees of the early varieties have been planted, and the early sorts injured the sale of the better fruit that comes later on. While there is a place for a few, there is great danger in getting too many of the early varieties.

The Triumph is the earliest yellow peach we have. It is a little small, but with proper cultivation it will reach a good size. It must be thinned

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and well fertilized. I do not consider it a really first-class peach, because it deteriorates in size in a few years.

Q.: What about the Greensboro' ?

A.: It is a large peach, but there is a prejudice against its green flesh. The Yellow St. John is the first really first-class peach we have. Brigden, or Garfield (which are the same), come next, and there is very little difference in the time of ripening between it and Early Crawford. Then follow in the order named, the Early Crawford, Fitzgerald, Yellow Rareripe, New Prolific, Engol Mammoth, and Elberta.

When we first grew the Elberta we found it more subject to curl leaf than almost any other variety. Now that we can perfectly control that, we consider it one of our most profitable varieties, and no other kind, perhaps, stands shipping better.

Q.: How do you control curl leaf ?

A.: It is easily done, by spraying with Bordeaux before the buds start ; one thorough spraying is sufficient.

Q.: Do you use arsenic or Paris green at the same time ?

A.: No ; there is no object in doing so.

A Member : A weak solution of blue vitriol controls it perfectly in our orchard.

A.: I find that it has a tendency to wash off.

Mr. Tweddle : Have you not found lime and sulphur better than Bordeaux ?

A.: It could not be better, because the Bordeaux is completely effective. The Golden Drop does not equal the other varieties named in order, but it is a paying variety, and should be included in every list. It comes in at a time when the other varieties are not on. It is of fair size, but is inclined to overload, and requires thinning. Next comes the Smock and the Salwy. From these twelve varieties I have selected six as my choice for commercial planting in my district, where a less number of kinds are required. They are : St. John, Bridgen, Fitzgerald, Engol Mammoth, Elberta, and Smock.

Q.: Why do you leave out the Crawford ?

A.: I consider the Brigden a little better peach, and in some respects hardier in bud, and of just as fine appearance. If there is any difference, it is a little earlier. Then follows the Fitzgerald, so that you do not require the Early Crawford.

Q.: What about the New Prolific ?

A.: It does well in some soils, but does not give such good results on the average. I will now proceed to the hardy varieties. Early varieties, like the Alexander, are very hardy, and you could grow them almost anywhere, but I am not including them in my list for the reason stated already, that there has been too many grown. For the hardy list I have selected the following : Fitzgerald, Barnard, New Prolific, Longhurst, Crosby, Tyhurst, Golden Drop, Bronson, and Lemon Free. This list is in the order of ripening, and not in order of merit. I would class the Tyhurst and the Longhurst as the two hardiest varieties in this list for our district.

Q.: Which are the least liable to danger from winter frost ?

A.: It is hard to pick them out, because they might ripen too late in any particular section, and then you would have to take something that ripened earlier.

Q.: What do you mean by hardiness ?

A.: Hardiness of the fruit bud. There is very little difference in the root ; it is not worth mentioning ; it depends upon the conditions surrounding the tree. Tyhurst and Longhurst ripen about the middle of September with us.

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Mr. Sherrington, Walkerton: They ripen too early with us. The Early Crawford has ripened with us, and a seedling from it, known as the Bruce, is the best we have in this section.

Q.: What about the Duke of York?

A.: It has not been much tested. It is very much like the Crosby. So far as we have seen, it is a splendid peach, hardy, and produces large crops.

GRAPES. By Murray Pettit, Winona.

My experimental work with grapes started in 1881. I planted about fifty varieties in addition to my vineyard, and kept increasing the number until I had about 100 varieties, in 1894. Of these about the only varieties I consider worth mentioning are the following: Armenia (Roger 39), Doctor Collier, Moore's Diamond, Woodruff Red, and the Mills. The latter shows weakness of vine, and is inclined to overload. It is an excellent winter grape —no better for keeping—and it ripens by Christmas. I think it superior to any other long-keeping variety.

In 1895 six varieties were sent to test. Of these the Brilliant is the only one of much value. In 1896 eighteen varieties were sent out, and none of them would I recommend. Among them was the Allice, which was highly lauded by the originator. It was sent out under seal at $2 per vine, but was nothing but the old Diana under a new name, which we have grown for thirty years. This will show you what a lot of humbug there is about these new varieties.

In 1897 six varieties wer sent out, and the only one worthy of note is Campbell's Early, which is of very good quality for a very early grape, but its chief quality is its earliness. I think it should take the place of Champion, as it is better in appearance and flavor.

The following list I consider profitable in our district for commercial purposes, given in order of ripening: First, Champion. This has been the most profitable in our section this year. Then, Worden, Lindley, Delaware, Niagara, Concord, Wilder, Agawam, Requa, Catawba, and Vergennes. The latter is an excellent late keeping grape, and a good yielder, but there is little to choose between that and Agawam. It is inclined to overload if not pruned very closely, and then it does not make enough vigorous wood for next year's crop.

Q.: What do you think of Moore's Diamond?

A.: It might be included in the list.

Q.: Where would you put it in order of ripening?

A.: After Worden. Its principal value is in its earliness, quality and appearance. It is not as productive as Niagara, but you will get a much higher price, as it is the first of the white grapes that comes in. If you want a nice early white grape for home use, grow a few Lady.

Q.: Is Moore's Diamond a good yielder?

A.: Not as good as the Niagara.

Q.: What about Brighton?

A.: It is of little value where you can grow the Red Rogers.

Q.: Do you recommend Campbell's Early for commercial purposes?

A.: I have not had it in fruiting long yet. but I think very favorably of it, and want to test it further.

Q.: Are there any small green grapes in the bunches?

A.: Not with me.

Q.: What about the Eton?

A.: It is soft and of poor flavor—of no use, I consider.

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Q.: How many out of the new varieties you have tested would you plant in a commercial orchard ?

A.: Until I have tested Campbell's Early longer, I could not recommend one.

Q.: Do you grow your vines on sand or clay ?

A.: On pretty heavy land, with stiff sub-soil.

Q.: Would you recommend the Salem for planting ?

A.: No ; it is subject to mildew, and bursts when it rains before it is fully ripe.

Q.: What are your objections to Moore's Early ?

A.: Not vigorous enough ; and you do not get enough fruit.

The market for grapes could be extended fully one-half if the following points were given attention to. The first point to be observed is pruning. Many growers allow too much wood on their vines, and the consequence is that the fruit is poorer in flavor and later in ripening. Another mistake is the shipping of mildewed grapes and unripe fruit. This has cost our growers thousands of dollars. It is a very easy matter to sulphur your vineyard to prevent mildew. Another mistake is holding the fruit too long before placing it in the hands of the consumer. Grapes are never better than the moment they are picked off the vine, and the sooner they are used after picking the more the consumer will enjoy the fruit. Tons and tons are held for days at the point of shipping, and then sold to jobbers. In one case I saw 18,000 baskets in a station fruit shed, some of which had been there for ten days and had been held for some days at the point of picking before that. The condition of these grapes—picked by cheap labor, and more or less bruised by throwing into the basket—the condition they are in when they reached the consumer can readily be understood.

Blackberries and Currants. By A. W. Peart, Burlington.

It is a difficult thing for an experimenter to decide at this stage of the work in the Province as to which are the best varieties to recommend. It is far easier to say which are unprofitable. If I were asked the question, Which is the best variety of currants ? I confess I could not tell you. Taking one year with another, I find there are several varieties that are pretty nearly equal. For currants, I find that the best soils are rich ones, with damp subsoil. With blackberries, I think that the best results are obtained in my district on a moderately dry, rich soil, having a quicksand bottom. I have not found many of the new varieties of currants I have tested to be superior to the old varieties. Of the red currants planted in 1896, I consider the following the most profitable : Wilder, Cherry, Pomona, Fay's Prolific, Red Victoria, and North Star.

Q.: Can you name one out of the lot ?

A.: I should not like to give one, because seasons vary, but I am rather partial to the Wilder ; it is very productive, is large, and of fine quality, and has all the qualities that go to make a profitable commercial variety. This year, however, it has developed leaf blight, which went through one part of the Province in currants. It completely stripped some varieties, and others lost a large percentage of their leaves. New Victoria, Raby Castle, and Old Victoria lost none, however.

Q.: What was the nature of the blight ?

A.: The leaves first turned yellow, then grey, and then dropped off.

Q.: Can you suggest a remedy ?

A.: I do not know that I can ; perhaps spraying with the Bordeaux mixture at the proper time would prove a remedy.

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The reason I like the varieties named is that they are from medium-sized to large varieties. I have discarded some old varieties, such as Raby Castle, Red Cross, Red Dutch, and Versailles, because the currants are too small to be profitable in a commercial way. There is a difference of a cent to a cent and a half per quart in the price. Belle of St. Giles is a large and beautiful currant of fine quality, but it is not very productive, and for that reason I would not plant it.

Q.: How does the Wilder compare in size with the Fay?

A.: It is as large, and in my opinion higher in quality.

Of the black currants tested, I think most of the following: Saunders, Naples, Black Victoria, and Collins' Prolific.

Q.: What about the Black Champion?

A.: It is not sufficiently productive with me. I am scarcely able to say much about Collins' Prolific as yet, but it seems variable in fruiting. Last year each bush gave seven quarts. They are rank, strong-growing bushes. This year they averaged only two or three quarts each. In regard to the whites, I have two varieties. The Grape is the larger and the more productive, but the Imperial is of better quality. In blackberries I consider the following the leading commercial varieties for the district: Agawam, Kittatinny, Ohmer, Snider, Stone's Hardy, Taylor, and Western Triumph. The Kittatinny and the Ohmer are large varieties, and the others medium-sized.

Q.: Is not the Agawam immensely larger than the Snider?

A.: No; slightly only; I classify it as a medium-sized berry. The Ohmer is a new variety, and is doing well. The Gainor is also a new variety, and is doing fairly well, and should be tested a little longer. Wilson's Early promises well, and gives a fair crop of large berries of good quality.

Mr. John Hall, Rochester: The Perfection currant is doing well in Western New York State. It was originated by Mr. C. G. Hooker, of Rochester, N.Y., and is a cross between Fay's Prolific and White Grape. The season for ripening is the same as Cherry and Fay. The color is bright red, and it is a good grower. The size of the fruit is very large, larger than Fay and Cherry, and the clusters are very long. It is more productive than the Fay, and resembles the White Grape in this respect. Quality very fine; not so acid as the Fay and other red sorts. As a table currant it cannot be surpased. A very important fact is that it has a long stem from fruit to attachment to branch, making it easy to pick.

RASPBERRIES AND COMMERCIAL APPLES. By A. E. Sherrington, Walkerton.

I have about fifteen varieties of blackberries. The hardiest and most productive in this section are the Eldorado, Agawam, and Snider. For fancy varieties I recommend Gainor and Rathbun. For black currants I would select Black Naples as the most successful in this district, and in reds, Fay's Prolific.

I want to confine my remarks to the varieties that have proved most successful and profitable in this district. In raspberries I have tested about 65 varieties. The most profitable early variety with us is the Reliance. It is hardy, fairly vigorous and productive. The fruit is not large, bright red, and is a good table berry. The Turner is one of the hardiest varieties we have. It is about equal to the Reliance in vigor, and is fairly productive. It is a little darker in color than the Reliance. The quality is first-class for a table berry. Both these varieties are too soft for shipping. The objection to the Marlboro' is that it is inclined to dwarf, and it is not a good table berry, but it is firm and dry, and is all right for preserving and shipping. It is early and productive.

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Q.: What is your soil ?

A.: A clay loam, mixed with limestone. For medium and late varieties the Cuthbert is, I think, the queen of berries. It is a hardy, strong grower, berries large, and quality first-class either for table or preserving. It has only one fault, that is that it continues growing too late in the fall. The Phoenix is very hardy, and very productive ; quality good. It is a heavier cropper than the Cuthbert, but not quite so good a berry, but it comes in later, and is profitable in that way. Of the light-colored varieties, the Golden Queen, out of half a dozen varieties, is the only one worth planting, and it is of no use for commercial purposes.

The purple berries, such as Columbian and Shaffer, are not profitable as commercial berries in this section.

James Metcalf, Blyth : I have grown the Columbian extensively, and find it quite marketable and the most productive berry I have. It is a very vigorous grower.

Mr. Sherrington : In blackcaps, Conrath is first on account of its earliness ; then Hilborn, then Smith's Giant, in the order of ripening. Conrath is a very vigorous grower. It is hardy, healthy, and productive, and the fruit is of good quality. Hilborn is also vigorous ; fruit large, and quality first-class. It is, I think, our best blackcap. Smith's Giant is also very vigorous ; fruit very large, and is proving to be very productive, while the quality is all that is necessary.

Q.: Have you tried the Older ?

A.: Yes. It is a good berry, but rather weak in its growth.

Q.: What about the Miller ?

A.: Very good, but not equal to those I mentioned as regards fruit. A great many Hilborn raspberries sent out were not true to name, and did not give satisfaction.

Q.: Do you spray ?

A.: I spray all my raspberries just the same as I do apples and everything else. I begin in the spring, and continue till blossoming, giving one spraying after bloom.

Apples and Cherries. By G. C. Caston, Craighurst.

We have been making some experiments with the Russian varieties, but without much success. We have failed to secure a good winter apple from among them. The Bogdanoff comes closest. This variety makes good stock for grafting good commercial apples on. I have been preaching the gospel of top grafting for the last twenty years. Another Russian variety is the Boiken. It has no claims as a table variety, but is a fairly good cooker. It is a clean apple, and a great bearer. So far, my experience with it is quite favorable ; but I think we should be careful about recommending anything until we are very sure.

Of the seedlings of the Fameuse, or Snow, we have the Shiawassee Beauty. It has not the same tendency to scab as the other Fameuse seedlings, but it is not quite so good in quality, nor is it a very long keeper. The season would be about November. Few are aware of the great difference that exists in the ripening and maturing of fruit in our more northern locality. To judge properly of our winter apples you should see them pretty well on in October, which is one reason why we cannot properly compete at such exhibitions as the Toronto Industrial. Our Spys do not mature till the end of October.

There is one apple I have no hesitation in recommending for our section ; it is a cross between the Spy and the Wagner, but it should always be top grafted. I can recommend it as a commercial variety.

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Q.: For export ?

A.: I think so ; but I have not had any experience in exporting. But I do not think we should devote all our attention to export fruit. There is a developing market in Northern Ontario and in the Northwest.

I can also recommend the Peerless, which is a seedling of the Duchess. It is early maturing, is free from scab, and has good quality and uniformity.

Mr. Macoun : What advantage has it over the Wealthy ?

A.: Wealthy is nowhere in it.

Q.: Where do you place the quality ?

A.: I consider it the best cooking apple in Canada. If the maximum points were ten, I would give it elven. I believe it would be a great acquisition to the Old Country market.

Mr. Macoun : I think the Wealthy is not only a better apple, but a more profitable one. I secured 96 barrels from 136 trees planted six years. They brought from 6s 9d per case, 138 apples in a case. They were shipped in October in ordinary storage.

Mr. Caston : The Spy is the commercial apple par excellence in this country, because it comes to its greatest perfection in Ontario. Everyone wants the Spy in our home market, and in shipments to Algoma I find that they want the larger proportion to be Syps. Top graft that apple every time on hardy stock, such as Tolman Sweet.

Q.: It is beginning to scab badly in our section ?

A.: We have to spray ; but I think it is the commercial apple of this country.

Q.: Can you get the Spy into bearing sooner by top grafting ?

A.: That is one of the advantages of the method. I have also tried a number of Russian Cherries, and we have certainly got something good in them. You cannot grow the finer varieties of cherries outside of the fruit belt, but you can grow the sour cherry for canning purposes. Outside of the dessert class, the Osthein will be valuable ; also Orel No. 24, Russian 207, and Bessarabian.

Q.: Which are the three best sour cherries in order of ripening ?

A.: Most of these varieties are medium to late.

Q.: What is the season of the Osthein?

A.: It is medium.

Q.: Is it better than the Montmorency?

A.: I have not tested it.

Q.: Have you any better early variety than the early Richmond?

A.: Yes; the Russian 207, in our locality.

PEARS. By R. L. Huggard, Whitby.

As requested by your Secretary, I am expected to say something on that most worthy, and perhaps least understood, of all the fruits—the pear. I will not attempt to get at the origin of the pear, but we have abundant evidence that it was well known and considerably cultivated before the Christian era. It was a common fruit in Syria, Egypt, and Greece in the earliest times of the Romans, who have the credit of introducing it into Italy. But historians generally agree that the delicious qualities of the pear were not developed till about the seventeenth century, since which time it has been steadily gaining in quality and flavor. But through such men as Prof. Van Monk, Mr. Knight, and many others, who have made a lifelong study of the pear, and also practiced the art of hybridizing so successfully, we have now a class of fruit which, for richness, juiciness, and flavor, is excelled by no other fruit grown.

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But in the limited time at my disposal, I had better confine my remarks to the more practical part of the pear, viz., how to grow pears to get the best results. The first consideration is to get the right kind of land to grow the pear on. Here I would just repeat what I have often stated elsewhere, that I know of no variety of pear that will produce the best results on wet or springy land; but the ideal soil for a pear is a stiff clay subsoil, with a rich clay loam surface, from 10 to 12 inches in depth; but any soil should be well underdrained before the planting is done. The selection of the varieties should be well considered, also the market where the fruit is to be disposed of; and those varieties which have been tested, and have proved hardy and productive, and bring good prices in the market, should be planted.

And surely out of nearly 3,000 known varieties the planter can select five or six varieties that will succeed. I consider it very unwise to plant very many different varieties. The pear has perhaps fewer insect enemies than almost any other fruit tree, and is therefore less trouble to grow than the apple, plum, or peach. Then through the exertions of our scientists and agricultural professors, whose bulletins are doing such a good work in Canada, the fruit grower is kept posted on these injurious insects, so that every grower can have the remedy if he will properly apply it. It has been often stated that "He who plants pears, plants for his heirs," but I can assure you that that couplet is not literally correct, as here are very many varieties that begin bearing the next year after planting, and continue bearing annually for many years, although varieties, like people, differ according to location, soil, etc.

The pear is not a native of this country, although many varieties succeed better here than they do in their native climate. It is said that the pear attains its greatest perfection in Belgium, but according to recent market reports from Bristol, England, Canadian pears have brought considerably higher prices than the same varieties from Belgium, so we may naturally assume that ours were the best.

As has been often pointed out, the gathering of the fruit should be done before it ripens on the tree. It is an easy matter to determine when the fruit is ready to pick, as by taking hold and gently raising the fruit; if ready it will easily part from the branch, although the fruit may be hard and solid, as it should be, when gathered. If intended for market, the fruit should be forwarded as soon as possible after gathering, especially the earlier varieties, as they get into the consumer's hands in much better condition than if kept a considerable time before shipping; but if intended for home use, they should be placed in cases in a dark, dry, cold cellar, to allow them to mature slowly. Late varieties, as winter pears, may be put into barrels, but I prefer bushel cases for earlier sorts; and shortly before being required for use, they should be placed in a situation where the thermometer registers 65 to 70 degrees, where in a few days the fruit will become mellow, juicy, and rich, especially if a piece of woolen cloth is first spread over the bottom, and also between each layer of fruit. In fact, it makes nearly all the difference between a rich, luscious fruit, and a harsh, coarse-grained commodity, in the way in which it is ripened.

Out of nearly 150 varieties that I have grown there are only about 25 or 30 that I consider profitable commercial varieties, in the district in which I live; for although hardy enough, they refuse to produce either quantity or quality to be commercially profitable. The people of this country have yet a good deal to learn with regard to pear growing, as the same attention has not been given to the subject as to apples and peaches, but I

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believe the time is close at hand when, through the medium of cold storage, the pear will rank in importance with the apple as a commercial commodity.

I have no data when pears were first introduced into this Province, but there are pear trees growing near Windsor, and also near Newmarket, that are evidently over 100 years old, and are still large, healthy, fruiting trees. They are said to have been brought from France by the Jesuit Fathers, who formerly occupied that section. The fruit on most of these old trees resemble the Buffinor in appearance, but have the flavor of the Clairgeau.

But it matters little, at this day, where the pear came from. The question is, "Can we grow pears profitably in Ontario?" Much depends on the grower. The next is, "Can we, or do we, grow too many pears now?" There is ample room for discussion on this subject.

But I feel assured that if double the quantity were grown of the proper shipping varieties, our people would enjoy increased receipts from a very nominal outlay.

Our great Canadian Northwest will also require and use a large proportion of our fruit product just as soon as transportation facilities are put on a proper basis, which, I hope, will be attempted before this annual meeting is brought to a close.

Q.: What are the names of half a dozen of the best varieties, in your experience?

A.: I would say: Bartlett, Clapp's Favorite, Sheldon, Bell's Lucrative, B. Clairgeau, President Drouard, Duchess, Seckel, Lawrence, and Winter Nellis.

Q.: What new varieties would you recommend?

A.: Dr. Jules Guigot. This is a later pear, and a good pear to ship anywhere; then Seneca, which is earlier, and Dempsey, which is a native of Our Province, and a very excellent pear.

APPLES. By W. H. Dempsey, Trenton.

Q.: What varieties are you finding the best in your district?

A.: None of the new varieties that I have under test would I set aside for the old varieties as yet.

Q.: How many new varieties have you been testing?

A.: Something over 300 varieties. In 1894, when I started the station, I had about 140 varieties under test in my own grounds, and have now increased the number to 300 apples, besides other fruits. The most promising of the new varieties, in the order of ripening, are Red June, Jefferson, McLean, Saunders, Beauty, Sutton's Choice, Winter Banana, York Imperial, and Gano. Some of these varieties have good qualities, but not good enough to take the place of the older varieties.

Q.: What do you consider three or four of the best fall apples out of the whole lot?

A.: Duchess, Trenton, Gravenstein, Fameuse, and McIntosh Red.

Q.: Would you include Blenheim Pippin.

A.: No; it is an early winter apple; I would recommend it only in some localities.

Q.: What about the Wealthy?

A.: I would take Trenton or Snow in preference.

Q.: Give the names of half a dozen winter apples?

A.: Hubbardson's Nonsuch, Westfield Seek, Cranberry Pippin, Ontario, Spy, Stark, and Ben Davis.

Q.: Is this in order of merit?

A.: No; in order of time.

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PEARS AND PLUMS. By Harold Jones, Maitland.

My work is of purely local value. The varieties I can grow are considered of very low commercial value in other parts of the Province. Plums have not hitherto been a success in our section. Hundreds of trees have been planted in Leeds and Grenville, but they always die out. In my own grounds I planted my plums in 1896. I have about 170 trees, two or three of each variety. The thermometer at my station goes to 25 deg. to 30 deg. below zero, and I have been endeavoring to find varieties that would stand such conditions. Of European plums I have about 40 varieties. Some have died out, some have showed weakness of bark or branch, and will eventually die. Out of that number the only ones I can recommend are the Lombard and the Whittaker. These have remained perfectly healthy, and have attained the age of six to nine years. The Lombard bears three years out of five. Upon the Island of Montreal they have a great many varieties that are seedlings from European plums brought in by the Jesuits, and planted in the early history of Canada. Some years ago the Quebec Fruit Growers' Association took a careful inventory of them, and classified and arranged them. Two of the best they have in the collection are Nos. 53 and 54.

Prof. Macoun: No. 53 is now called the Raynes, and No. 54 the Mount Royal. They can be had from Mr. Dunlop, of Montreal.

Mr. Jones: These are just nicely started with me, and I believe it may be possible to get something of value to our section from this collection. These are considered the best varieties in the lot.

Q.: What is the color?

A.: They are blue plums.

I have fifteen varieties of Japanese plums, all recently planted except Abundance. All have lived except one. Abundance fruits irregularly, and gives a scanty crop. The same may be said of the Burbank, the Wickon, and the Gold Plum. I cannot recommend or condemn any of the Japs for our section as yet.

It is to the American or native plums that we must look for something valuable for our section. I have eight or ten varieties growing, and some of them are of very fair quality. They are excellent for cooking and jam making. Among the best I have fruited is the Milton, a bright red plum. It is not of high quality, but is an early ripener.

The Whittaker is the best plum I have fruiting. It is a rapid, vigorous, strong grower, does not break down with weight of fruit or foliage, is very free from disease, and is of good quality for its class. Next in order of ripening is the Hammer. It is hardly as large as the Whittaker, and the skin is too thick to be a fine plum. It also has a tendency to burst open about the time of ripening. Next in value is Forest Rose. It is similar to the Hammer, but breaks under foliage and fruit. These four are all hardly in every way.

In regard to pears: Flemish Beauty is successfully grown in our section. It grows large and fine, and is of good quality and texture, and compares favorably with fruit coming from any part of the country. The Keiffer is also a very satisfactory pear, and the heaviest bearer we have, but the quality is rather low, as all will admit. I have also the Howe, planted in 1896, which is bearing nicely. The Riston is hardy, healthy and vigorous, and the fruit is of fine quality, but it is too small to be of much commercial value. What Russian varieties have been sent me have died rapidly from blight.

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STRAWBERRIES. By E. B. Stevenson, Jordan.

Among the early varieties we have the Michael, August Luther and the Van Deman. Michael is the best money-maker we have on the moist, sandy soil around Jordan. The Van Deman would do better in the Guelph district. The Monitor is a new variety, and I would advise all strawberry growers to plant some. It is large, a bright red, firm, and has no small berries. It keeps its size to the end, and yields a big crop. I can also recommend Johnson's Early and the Smith Seedling.

Q.: Do you recommend all these?

A.: The grower will have to find out which variety will suit his soil; the strawberry is peculiar in this respect. The Bederwood and the Clyde do well everywhere. The latter does well in all sorts of soils, and is one of the best early varieties.

W. Fisher: I would not give it room. It is no canner, has no color, is no shipper.

Mr. Stevenson: Some growers will not grow anything else. It will ship as good as any for a near market, if you pick it at the right time. If you keep it picked, it will return you as much money as any of them. I admit it is light in color, but it is fairly firm, and an immense cropper.

W. W. Hillborn: It does well with me.

Mr. Stevenson: For medium late varieties I recommend Haveland, Tennessee Prolific, Saunders, Glen Mary, Sample, Brandywine, and Splendid.

For late to very late, I would give Aroma, Gandy, Joe, Klondike, and the Hunn. This season showed up the late varieties, and I found Joe, which is a new one, among the best of them.

I find that the best method of growing is to grow in narrow rows. The best strawberries grow at the edges of the row, and the more edges you have the more fine berries you will get. Narrow rows yield finer berries, and give a better return than wide matted rows. Plant the rows three feet apart each way. Cultivate both ways for a time, and as soon as the runners begin, cultivate one way only. In some sections the plants require covering in the fall. They do not need it in our section, but they are the better for it. The covering can be raked into the pathways in the spring, and used as a mulch, and it will keep the berries clean. The first season it should be cultivated eighteen inches wide between the rows. In the fall give a dressing of unleached hardwood ashes, and cover with straw. In preparing the land, the best plan is to have the land in roots for two seasons, manuring each crop well, and then manure again before planting the vines.

One man in our section who followed the plan outlined secured the first season six hundred 24-box crates, or 14,440 boxes. At five cents a box, that would mean $720. For the second year he had over 12,000 boxes, which at the same price would give $600. The varieties were Williams and Clyde. Three acres of new land, belonging to another grower, planted to Williams, Michaels, and Clydes, the latter representing about one-third, yielded 1,200 crates, and he told me he cleared $1,100 the first year, after paying all expenses. There are two cases showing that land properly prepared and properly cultivated, and kept free from weeds, will yield as much, if not more, than any other fruit.

In each case the yield the second year was nearly equal to the first.

The wide matted row must go, if the best results are to be received from the strawberry, the "Queen of Fruits."

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The Ben Davis Apple.

The President: Notwithstanding what has been said against it, I do not think that those who have planted the Ben Davis should be at all discouraged. Do not top graft with something else yet. There is no apple grown up to the present time that has given better commercial results, and no apple that is more called for in the English market, and it is a good cooker at a time when other apples are over.

Mr. Woolverton: I have a clipping from an Illinois paper giving the experience of fruit growers there with the Ben Davis. The Fruit Growers' Journal, of Cobden, Ill., says: "The current receipts of apples in this and other leading markets of the west at present, and for some time past, show that over 9-10ths of the receipts are of the Ben Davis variety. Last Saturday four boatloads unloaded on our levee 10,000 barrels of apples, fully ¾ of them from Illinois, and the remainder from Missouri. A canvass of the subject among the receivers disclosed the fact that 9,500 barrels were Ben Davis, and railroad receipts show a similar record. Now, this proportion is out of all reason, greatly to the detriment of the apple industry, and an injury to the apple growers at large.

"For years the Ben Davis has been found a profitable apple from a commercial standpoint, and this has led to a heavy run on the nurserymen for such trees. The demand not only continued without abatement, but rapidly increased, to the exclusion of all the better sorts, and we are confronted with the startling fact that a large number of the best varieties grown have given way to one of the poorest—an apple hardly fit to eat or cook—and yet every market, the entire southwest, is now flooded with it. The inevitable result is before us, as the Ben Davis is now selling at figures that average only a trifle over half that the other sorts are bringing.

"A more discouraging feature is still in store for the Ben Davis, for most of the orders coming in for apples now request no more Ben Davis. Even the country merchant, who orders only five or ten barrels, invariably adds: "Don't send any Ben Davis." Thus much lower prices still for it seem assured, while the other sorts will not suffer decline, because they are wanted by the trade everywhere."

Mr. McNeill: I see by Woodall's Catalogue that the Ben Davis is specially asked for in the British market. (Not supplied.)

Q.: What is the cost, as compared with the King?

A.: The price of the King was eighteen shillings, and of the Ben Davis twelve shillings. The cost of growing the King is about 45 shillings, and the Ben Davis about five shillings.

REPORT OF COMMITTEE ON FRUIT EXHIBITS.

By A. E. Sherrington, Lake Huron Station.

Apples: 33 plates. Of these the striking varieties are Ontario and Mann.

A. Shaw, Walkerton: 13 plates apples, 1 plate Duchess. Of these 2 plates seedlings, which do not appear worthy of mention.

John Whitehead, Walkerton: 13 varieties. Excellent specimens of Swazie, Pomme Grise, and 4 of Spy, 1 Snow.

Chas. Young, Richard's Landing, St. Joseph's Island: 11 varieties, as per list. It is striking to find Yellow Transparent in fair condition at this date. McMahan White is one of the best of this Algoma collection.

A. W. Peart, Burlington: 7 varieties apples, 4 varieties pears. Apples are clean and well formed. Anjou and Easter Beurre pears are good types of their kind.

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Central Experimental Farm, Ottawa: 13 plates, 12 varieties. This collection is particularly clean and handsome. La Victoire, a Quebec seedling of Fameuse, somewhat larger than the parent, is worthy of mention. Milwaukee, a Wisconsin, promises well for the north. Arctic, a Mars apple, of Baldwin type, well spoken of in Grand Isle.

Robert Thompson, of St. Catharines District, exhibits for that region a collection of 30 varieties. The most striking variety is Baldwin, beautifully colored.

R. L. Huggard, East Central: 28 plates of apples, 26 plates of pears. Among the apples are Ontario, Wolf River, and Spy, in good condition.

Duchess, shown by W. H. Bunting, of St. Catharines: In storage since August 4. Are apparently in good condition, but are found to be rotten and discolored at the core.

M. Pettit, Winona, Ont.: 22 varieties of grapes, in excellent condition. Particularly good types of Agawam, Goethe, and Catawba are shown.

G. C. Caston, Craighurst: 17 varieties. Apples are all handsome, and highly colored. Peerless, a Minnesota seedling of Duchess, is a promising fall apple. Of winter apples in good condition are Ontario, Spy, and Canada Red.

J. E. Hamby, Cedar Springs: Eight varieties of handsome, well-grown specimens, handsomely colored. Gano, Spy, Rhode Island, King, and Salome are specially worthy of mention.

W. M. Orr, Fruitland: Two varieties apples, 2 pears, good, handsome; 3 grapes, excellent Vergennes.

Fonthill Nurseries: 50 plates of apples. Among newer varieties are Huntsman, Mammoth Black Twig, Bismarck, York Imperial, and Sutton Beauty.

R. M. Palmer, Department of Agriculture, British Columbia: Display of handsome, highly-colored, large apples, all more or less peculiarly ridged and elongated, after the manner of Pacific Coast apples. Prominent among them are Northern Spy, Red Cheeked Pippin, Spitzenberg, Ben Davis, Van de Vere, English Golden Russet, Northern Spy, Blue Pearmain.

Joseph Tweddle: A display of Northern Spy, magnificent in size and color.

W. W. Cox, Collingwood: Good specimens of Ontario, Wagener, Wolf River, and Cranberry Pippin.

W. H. Dempsey, Trenton: 36 varieties of apples. Excellent specimens, Spy, Windsor, Chief, Ontario, Blenheim.

Harold Jones, Maitland: Fine specimens of the Fameuse group, including McIntosh, Scarlet Pippin, and Fameuse. Milwaukee is shown in good form.

C. L. Stephens, Orillia: A collection of Orillia-grown fruit, including samples from J. P. Cockburn, of Gravenhurst, who exhibits Winter, St. Lawrence.

Other exhibits: Hairy vetch—a cover crop; plant shown by Joseph Tweddle, Fruitland.

Your Committee beg to make the following comments: We would commend those exhibits which contain specimens illustrating most typically the varieties represented. We do not wish to encourage large collections of poorly-grown specimens of well-known kinds. The exhibits are largely made in the interest of the locality in which our annual meeting is held, and, therefore, should be primarily educational.

JOHN CRAIG,
W. T. MACOUN, Committee.

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FRUIT GROWN IN ALGOMA.

Richards' Landing, Nov. 26th, 1902.

L. Woolverton, Grimsby :

Dear Sir: I have sent by express a small box of apples, directed to you. Hoping you may have a pleasant time.

No. 1, a seedling of my own, or supposed to be ; anyhow, it certainly came out below the graft. No. 2, also supposed to be a seedling ; I did not grow this myself. No. 3, sent for comparison ; not desirable. No. 4, Wealthy. No. 5. Wallbridge. No. 6, Alexander. No. 7, Duchess. No. 8, Yellow Transparent. No. 9, Wagener. No. 10, Tallman. No. 11, Gedner.

These are not by any means show or fancy apples, but just a fair specimen of what I would call No. 1. If you call any of them very good or extra, let me know.

I am, yours truly,

CHAS. YOUNG.

RESOLUTIONS.

Moved by G. C. Creelman, seconded by Alex. McNeill : "That this Association desires to place on record its appreciation and admiration of the work done by Mr. A. E. Sherrington in connection with this Convention. Since the meeting was announced, one year ago, Mr. Sherrington has been indefatigible in his efforts, and has not confined his work to the Town of Walkerton. He has made a personal canvass through the Counties of Huron and Bruce ; has organized local Fruit Growers' Associations at six points in the district, and has revived the local Horticultural Society in this town. All of these bodies have assisted in making this Convention the splendid success it has been, and we take great pleasure in presenting this resolution to the meeting." Carried.

Moved by M. Pettit, seconded by H. Jones: "That this Association desires to tender its warmest thanks to the good people of Walkerton for the very hospitable manner in which we have been entertained since coming to this beautiful town, to the Mayor and Council for the excellent accommodation they have placed at our disposal in the use of their Town Hall and committee rooms for our several business meetings, and to the splendid orchestra which contributed so much to making the evening meetings attractive ; and we wish the Horticultural Society organized here a most successful and useful career in the work upon which it has entered under such favorable auspices." Carried.

The Convention then adjourned.

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HORTICULTURAL SOCIETIES.

At the regular meeting of the Ontario Fruit Growers' Association, held at Walkerton in December, an innovation was aodpted in the holding of special sessions for the members of the Horticultural Societies, at which many valuable addresses were given on topics of interest to the amateur gardener. Such was the success of these meetings that it is hoped to have a two days' session this year entirely devoted to the subject of floriculture and gardening. At Walkerton the members of the local Horticultural Society turned out in large numbers to hear the addresses and take part in the discussions on the cultivation of roses, perennials, annuals, hardy shrubs for the lawn, and kindred topics. Mr. T. H. Race, of Mitchell, the well-known amateur rose grower, presided at these meetings, and had associated with him such well-known florists as R. B. Whyte, of Ottawa; J. S. Scarff, of Woodstock; Wm. Hunt, of the O. A. C., Guelph; Chas. Webster, of Hamilton; Dr. James Fletcher, of Ottawa, and others. The papers published herewith are among those read at these meetings.

The "Notes on Floriculture," by Mr. Hunt, and the splendid articles on "Conifers" and "Maples," by Mr. W. T. Macoun, of Ottawa, which are reprinted from the "Canadian Horticulturist" of last year, have been so highly spoken of, that it has been deemed wise to put them in this compact form for constant reference.

THE BENEFITS OF HORTICULTURAL SOCIETIES.

By J. S. Scarff, Woodstock.

Having heard so many able and eloquent addresses from the gentlemen who have preceded me, it is difficult to add anything to what they have already said.

The subject assigned me has been written about and discussed from time to time. I cannot say much that will be new or of value to any hearers, and I can but fail in the attempt of trying to give a few observations, having been a somewhat close observer of everything pertaining to horticulture and floriculture for the last 20 years. During these years I have seen many advantages and improvements that have come through our local Horticultural Society in the city of Woodstock, and other cities and towns throughout the Province.

The great volume of information which has been collected and distributed among the thousands of horticulturists and floriculturists throughout this Province has been chiefly through the various Horticultural Societies of Ontario, and I am glad to know that the past year has been a successful one, both in the increase of membership in these societies and the increased interest taken in their meetings.

The study of horticulture and floriculture is not of recent date. History informs us that the Greeks and Romans delighted in horticulture, and to them we are indebted for many of our most useful plants. They cultivated flowers very extensively, and with great success, but long as their cultivation had been carried on, it had by no means reached perfection.

Looking back during the last thirty years reveals the fact that great progress has been made in floriculture in all parts of the civilized world.

Apart from what Horticultural Societies have done, I am also pleased to see throughout the country the manner in which our universities and higher educational institutions are taking up the work of landscape gardening and kindred subjects. Floriculture, when broadly pursued, is an

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education in itself; it requires great powers of observation and induction, and it has also a great moral influence.

The methods adopted during the last few years have been very much improved in Ontario, and great benefits are derived by the members of the Fruit Growers' Association, through the journal of The Canadian Horticulturist, the official organ of the Fruit Growers' Association, which a few years ago was only a small 16-page monthly journal, but has now developed into a 48-page magazine, so ably edited by our esteemed friend, I. Woolverton, M. A., of Grimsby, and is distributed monthly to every member of this Association. It is now extensively quoted by British, American, and other foreign horticultural journals, and it is constantly improving, taking a high rank with the best horticultural journals in America.

As was suggested some years ago, regular monthly meetings are a necessity of our local Horticultural Societies. Each night some special subject should be selected for discussion. A great many of the societies have adopted this plan, and good results have followed at these meetings. The younger members are induced to prepare a paper for the evening, and by this means much good has been done.

Another feature of interest at these monthly meetings is where members bring new plants of different varieties; also well-grown fruits and flowers. Thus, by comparison of results and discussion, good must follow.

The local Horticultural Societies are an interesting feature in the work of the Fruit Growers' Association, and are looked upon with great favor by the Department of Agriculture. The affiliated Horticultural Societies are proving to be far more successful in their operation than the Agricultural Societies, which are carried on in many places chiefly for the benefit of a few professional prize-winners.

One line of horticultural work which is becoming quite prominent, and is being fostered and encouraged by the local Horticultural Societies, is the improvement of civic parks, boulevards, private residences, and school grounds, in many of the cities and towns; also during the summer months the holding of garden meetings at private residences, where a great many object-lessons are obtained, and which are largely attended and much appreciated. I would call the attention of my hearers to page 438, October number, 1902, of "Canadian Horticulturist," which describes one of these meetings held in the city of Woodstock.

Our local Horticultural Society is also holding successful annual floral exhibitions, which are continued for two days.

During the year we distributed to the members, fruit trees and bulbs to the amount of $60, in addition to the premium distribution of trees, shrubs, and vines from the Association; also the illustrated monthly magazine, "The Canadian Horticulturist."

Not having had the pleasure of visiting this beautiful town in the summer, I cannot say to what extent your citizens have gone in decorating their homes with lawns, shrubs, and flowers; but since coming here I heard some of your citizens say that, being so far north, the weather is too cold to raise flowers with any degree of success.

Some twenty years ago, when I made my first visit to Manitoba, there was scarcely a tree, shrub, or flower, to be seen in the city of Winnipeg. They all claimed that, owing to the severe winters, they were unable to raise trees or shrubs. This last summer I spent a couple of months in that city, and I am pleased to say that they don't need to take a second place to any of our cities. Their parks in the different parts of the city are

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beautifully laid out with trees, shrubs, lawns, flower beds, etc., and are well kept. Many citizens also have front gardens, lawns, and window boxes, which would be a credit to some of our more pretentious cities in this country.

I was told while in the city that the Horticultural Society was largely the means of promoting such improvements, and what they can do in the Northwest country surely you can do here. What Horticultural Societies have done in other places can be done in the town of Walkerton through the influence of the members of your local Horticultural Society.

The great mass of the people are beginning to realize the importance of the movement in behalf of civic beauty. Back yards that have been mere receptacles for rubbish, etc., can be transformed into places of beauty. Front yards that have been ill kept can be made into beautiful lawns and flower beds. Public parks and streets can be made into walks of beauty through the influence of the members of a good, live Horticultural Society.

Not many years ago the great city of Cleveland was called the "Forest City"; to-day, through the energy and influence of horticulturists, that city has now come to be famous as "The City of Flowers." The same can be done in all our Ontario towns and cities. It is surprising also to note the improvement of late years which has taken place in the minds of the children, showing such a good knowledge of flower culture. Our duty is to encourage the children in the art, in order to cultivate a taste for it. Give them something to do in the improvement and beautifying of our homes. Talk the matter over with them, and let them know that they can help you along. They like to have responsibilities put upon them. Let them feel that you trust them, and they will not disappoint you. It will make them better fitted to take their place as men and women in later life.

In years gone by too many men considered flowers as fit only for the pleasure of women and children; but in recent years things are changing. Men are now waking up to a realization that they have lost a great deal by not having given more attention to them.

"THE TOWN BEAUTIFUL."

By C. L. Stephens, Orillia.

The beautification of the town in which we live is an object which commends itself to every patriot, and

> "Breathes there a man with soul so dead,
> Who never to himself has said
> This is my own my native land."

Certainly there are none such amongst those whom I now see around me. The first essential of a beautiful town is beautiful homes—the individual homes of the people—whether it be the palace of the millionaire or the humble cottage of the artizan. There is no true woman who ever rests satisfied with seeing the outside surroundings of her home continually in a state of mess and disorder, which may, to the unobservant eye of her better-half, be but the normal and proper condition of things; but to her finer perceptions they stand in need of a remedy, and her first attempt at improvement is the raking up of litter, etc., and then, if space at all permits, the planting of a flower or shrub or anything available which will make a show of greenery or color; one flower or plant only creates a desire for more and more again, and so the desire grows on that it feeds upon. In course of time a vine-embowered cottage or beautiful garden of flowers is the result.

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and not one only so beautified, but a whole neighborhood, a whole village, a town becomes the place of beautiful homes. We find examples of this process of growth all over our fair Dominion, from ocean to ocean; wherever the cabin of the settler contains a woman, will be found this desire for tasteful homes and surroundings, which finds its first expression in the planting and care of a few flowers. The woman having thus by her exertions and example brought about the conditions of beautiful homes, the duty, chiefly, of the man begins in the making of a beautiful town; not that this is solely the duty of the man, but in his capacity as the taxpayer he has to oversee and pay for the necessary work, encouraged and advised, of course, by the gentler sex. In this work of town improvement or bautification, as considered apart from water and light supplies, and such other public necessities, the exertions of our Horticultural Societies may profitably and legitimately be engaged. This may be done in various ways. The most feasible would seem to be: the creation, first, of a public interest in the matter of streets, boulevards, sidewalks and planting of street shade trees; then engaging the co-operation of the town authorities, and any other active public organizations in the town to use their joint endeavor to see that all moneys expended and all work done in connection with any of these branches shall be used to the very best advantage. The judicious planting and pruning of trees and proper care of boulevards have a greater effect on the general appearance of a town than almost anything else, and here the judgment and advice of competent persons should always be availed of. I might here suggest that the maple, although a splendid tree, and dear to the hearts of all Canadians, is not an ideal shade tree for street planting. It grows too low; at 8 or 10 feet from the ground it branches out, and makes a thick, close head, so that in 15 or 20 years it becomes an obstruction to light and air, and it has to be entirely removed, or some butcher gets at it with a saw, and cuts off nearly all the top, leaving a most unsightly array of bare trunks and stumps; in a few years there is again a growth of head thicker and closer than ever, and the same treatment results. The elm I conceive to be the very best of all trees for street planting. With very little care it can be grown to branch at 25 or 30 feet from the ground, and to gradually extend its giant arms over the adjacent houses and street, forming a grateful shade high up, and admitting plenty of air and light—two most important matters. I would most strongly recommend the elm for street planting.

A town or village can never be made beautiful so long as live stock of any kind is permitted the free use of the streets; therefore, what is commonly called a "cow by-law" should be a first step toward the object sought; then as matters progress, the removal of all street fences in front of ornamental grounds should be encouraged, so that the passing public may enjoy their share of the beautiful flowers and foliage, which, as we have seen, were the beginning of their beautiful town. The force of public opinion will, in such a town, naturally provide that whatever money may be needed to carry out the public parts of this work shall be raised in the usual way. Having now provided for the "Town Beautiful," with its many vine and flower embowered homes, whether the palatial residence of the millionaire, the luxurious mansion of the successful merchant, the less pretentious home of the mechanic or clerk, or the more humble cottage of the laborer, all alike surrounded or fronted by the well-kept lawn or boulevard, with its well-made streets and sidewalks, its fine shade trees, properly pruned and cared for—all alike beautiful and pleasing to the eye—it remains but to con-

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tinue from year to year, I might say from day to day, the effort to maintain the condition arrived at, to make your town a place of beauty and a joy forever.

OUTDOOR ROSES FROM A CANADIAN STANDPOINT.

By C. M. Webster, Hamilton.

Viewing rose culture from a Canadian standpoint reveals many points essentially different from the conditions which obtain in the broad States to the south of us. In the matter of hardiness, for instance, our winter, always more or less rigorous, will forever preclude for outdoor culture the great variety of Tea Roses which are so highly thought of in the Southern States. We are here usually compelled to cultivate them as annuals, or rather to take them up annually for protection, or protect them quite heavily if left out doors. With the best care we can never secure the large sized, well-established, wonderfully prolific bushes, that are so common where the winters are not severe. Different methods must be pursued, selection must be confined to the most satisfactory kinds only, but though in most parts of the country the cultivation of this class of roses is attended with a little extra work and some uncertainty, they are nevertheless everywhere prized for thir beauty and prolific blooming qualities. Much that is printed about roses in United States catalogues and floral periodicals refers to the latitude of Philadelphia and Washington and is the cause of endless dissatisfaction when put into practice by Canadians. For the above stated reasons only, a review of rose-growing from a Canadian standpoint would be time well spent.

How much of Canada may be considered a standpoint from which to view the question of outdoor roses? There must certainly be a northern limit, just as there is a limit for the growth of all deciduous vegetation. When however we take into consideration the recent report of our Dominion Superintendent of Forestry, that corn, tobacco, muskmelons and even tomatoes reached maturity in the Peace River valley, which the map shows to be as far north as the middle of Labrador ; we must agree that the area of country eligible for plant growth is large.

As a result of extensive correspondence, I am able to state that Hybrid Perpetual Roses are cultivated with good success in Newfoundland, also is the Laurentian mountains, the highlands of Quebec, where many of the wealthy of that Province now maintain summer residences; coming westward we find that the north shore of Lake Superior is extremely cold and trying to plant growth, at the C.P.R. station called Schreiber, I understand that Moss Roses have been coaxed to grow in spite of the fact that frosts occur at night even in the midsummer months. In the locality of Winnipeg certain hardy roses give entire satisfaction. At Regina, in the Province of Assiniboia, Rugosa Roses, Moss Roses and some of the hardiest of Hybrid Perpetuals have been wintered for several years. In that province the wind is found to be more of an enemy to roses than the severe frosts, and it is found desirable to plant in the shelter of windbreaks. The most northerly point in the Prairie Provinces about which I have accurate information about the cultivationof roses is at Prince Albert in the Province of Saskatchewan, where very fair success with cultivated varieties of roses has been obtained. Northern British Columbia furnishes food for more than passing thought. It is claimed that in proximity to the coast roses may be grown with entire satisfaction to a very northerly latitude, while in the southern part of that Province and on Vancouver Island is found the Canadian Paradise for roses. On the Island it is

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quite common to pick the flowers of Tea Roses outdoors at Christmas, and all the most tender kinds will winter outdoors with scarcely any protection. At all the most northerly points there is a factor in plant growth which is sometimes lost sight of after the chilling thought of the profound depths which the thermometer reaches;—that is the article with which Kipling tried to advertize our country, the Beautiful Snow. I will endeavor to make my meaning plain by two little instances.

On certain islands in Lake Superior, off Port Arthur, many market gardens are found, in fact, there is more cultivated land on this little island than on many miles of the mainland, and there gladiolus bulbs and potatoes are often left quite safely in the ground without protection. In spite of the fact that the thermometer reaching about 40 degrees below zero is not at all an uncommon occurrence.

A few years ago a customer in the Muskoka district sent an order for outdoor roses which he wished to plant immediately, the order in early December, he said if possible to send them on at once. He received an answer that our facilities enabled us to ship at any time, but as there already a substantial crust of frozen ground at Hamilton we judged they would have to wait till spring. A prompt reply was received from the customer containing instructions to ship at once. he wished to plant through the snow. There is the explanation. In many parts the snow begins to accumulate before the ground freezes, and in almost every instance it falls deep enough and lies constantly enough to prevent any great amount of frost from reaching the ground. This beneficent protection applies only to bush roses, and those below the snow line. Climbing Roses should be laid down, at least until their hardiness is ascertained, and Tree Roses so much grown in Great Britain, France, etc., are better left out of the Canadian gardener's calculations altogether. Unless his residence be in British Columbia or the most southern counties of Ontario, they are too difficult to protect, and one good hard winter usually freezes them back to the stock they are worked upon, and so terminates the usefulness of the plant.

I should also mention the Province of Alberta, where excepting in the most northerly part and possibly the section farthest removed from the sheltering Rockies, roses are eminently satisfactory. Now as to the older settled parts of Canada. Ontario as far north as Lake Nipissing may be set down as favorable for the queen of flowers. From Montreal northward along the St. Lawrence the climate is very trying, being very cold, and the snowfall is uncertain because of the modifying influence of the gulf. New Brunswick is, in that portion which is tempered by the Atlantic, a splendid climate in the summer and not severely cold in winter ; the same may be said of Nova Scotia and Prince Edward Island. There are numerous fine rose gardens in those parts.

Altogether Mother Nature has endowed our fair country with a good climate so far as the production of good rose flowers is concerned. We may not be able to grow successfully the Tree Roses, the Climbing Noisettes, nor get the degree of satisfaction from the Tea Roses that they do further south, but so far as this continent is concerned I firmly believe that, in the magnificent outdoor class the Hybrid Perpetuals, the trophy of excellence will eventually lay with Canada. The United States rose exhibitions may very soon hear from Canadians in the matter of outdoor roses as they have heard from Messrs. Dale, of Brampton, and Dunlop, of Toronto, in regard to roses grown under glass. At the exhibition of the American Rose Society at New York, these two firms have for the last two years captured many of the most cherished first prizes.

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I intended to dwell briefly on culture and best varieties, but will have to be very brief as I have already taken up too much time.

The question of budded plants versus those on own roots seems to be never settled. To my mind there is a great advantage in budded plants where quick results are desired, but they possess no permanent advantage over those on their own roots, and constant care is needed to prevent suckers from the stocks from appearing and sapping the strength of the good roses. Own root roses are especially desirable for cold portions of the country, for in the event of a cold winter when plants may be frozen close down to the ground, an own root plant, possessing as it does many latent eyes below the surface, will usually grow again and will invariably produce the true rose, so long as any portion of the branch or root grows.

I consider the following ten Hybrid Perpetuals as good a selection for color, form and fragrance as can be made, Jean Liabaud, Anna de Diesbach, General Jacqueminot, John Hopper, Magna Charta, Margaret Dickson, Madame Chas. Wood, Alfred Colomb, Madame Gabriel Luizet and Earl of Dufferin.

For the ten hardiest Hybrid Perpetuals the following would be chosen, Baronne Prevost, Caroline de Sansal, La Reine, Jules Margottin, Baron de Bonstettin, General Jacqueminot, Abel Grand, Paeonia, Marquis de Castellane, and lastly Madame George Bruant, which though not a Hybrid Perpetual and not double enough to be called a first-class bloom is exceedingly hardy and very pure white in color. There are several of the species that while not of use for exhibition purposes, are exceedingly hardy and showy, and are first-class material with which to begin a rose garden in sections where success is at all doubtful. Among the best known species are : The Province Rose commonly known as the Cabbage Rose. The Moss Roses, among which the strongest growing varieties should be selected. Rosa Damascena the Damask Roses. The Persian Yellow Rose, which is, I believe, botanically classed as the Austrian Briar or Rosa Lutea. Rosa setigera the parent of the valuable climbing variety Prairie Queen. Rosa Rugosa in several varieties. Rosa rubiginosa the English Sweet Briar is perfectly hardy in Ontario and desirable as a garden rose, it is worthy of a trial in more severe localities as well as its splendid hybrids known as Lord Penzance's Sweet Briars.

In conclusion, the rose, besides being the "sweetest flower that blows" is inseparably linked with the traditions of Old England, and consequently with the sentiment of every British subject, and that the rose will never reach a climax of popularity in this the most loyal of Britain's possessions we may feel assured.

Mr. T. H. Race, of Mitchell, suggests the following as being the most suitable for most points in Ontario. Beginning with the dark shades this list will cover the range of colors : Baron de Bonstetton, Gen. Jacqueminot, Alfred Colomb, Lady Helen Stewart, Mad. Chas. Wood, Magna Charta, Francoise Levet, Mrs. Sherman, Crawford, Common Moss, Crested Moss, Mad. Plantier, and the climbing Caroline Goodrich.

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BEDDING GERANIUMS.

By Wm. Hunt, O. A. C., Guelph.

It is oftentimes a most difficult task to select the best varieties of these most useful and popular bedding plants, and those most adapted for bedding out purposes, from amongst the numerous varieties now offered by florists and nurserymen. Despite the fact that many of the most prominent landscape architects and gardeners consider that a bed of scarlet or of any decidedly prominent color of geranium is somewhat out of keeping and shows bad taste if planted on front lawn, the geranium is still the one universally popular bedding plant amongst the great majority of flower-lovers The increased demand for these plants every season of recent years has brought to the front many beautiful varieties and types that have proved most useful as decorative plants, whether for the greenhouse or window in winter, or for the lawn and flower-garden in summer. Those of us who remember the varieties of bedding geraniums grown upwards of a quarter of a century ago, such as Scarlet Stella, which, though beautiful in color, would, with its narrow petaled flowers and its loosely formed truss, bear no comparison (especially in form) with such varieties as J. P. Cleary, or even of the better known Alphonse Riccard, Gen. Grant and others having good records as bedding varieties at the present time. The old pink Christine and the Dwarf Scarlet Gen. Tom Thumb grown so extensively about the time that Scarlet Stella was such a favorite, have all been superseded by many varieties of greater merit, not only as decorative plants for the garden but also for cut flower purposes for use in the home. Although the old fashioned varieties that I have mentioned had of necessity to be dropped from our list they will be remembered by old-time plant lovers as having been most useful in their day and as being the progenitors of the beautiful varieties and types now in existence.

With the introduction of the really double-flowering varieties, Glorie de Nancy (scarlet) and Madame (pink) about the year 1866, came a new era in geranium life. These were the heralds of the beautiful semi-double varieties that are so popular at the present day. Both of the varieties mentioned caused quite a sensation at the time of their introduction, but like many other new types of plants did not apparently meet the requirements of the flower-loving public even at that time. Their strong rank habit of growth and the density of their flowers in the truss, made them undesirable as either greenhouse or garden plants. Like the earlier type of the single-flowered varieties before mentioned these, however, were useful in their day, and were the pioneers of the lovely double and semi-double varieties now so extensively grown and admired.

Amongst the double and semi-double varieties of geraniums useful as bedding plants, there is none more reliable and deservedly popular than the rich crimson flowering variety, S. A. Nutt. Whether planted in masses or used in ribbon borders, or even as a simple plant in the border, this variety, with its dwarf and free flowing habit, is generally regarded as the peer amongst what may be termed the ironclad varieties of geraniums, having a good robust constitution.

Amongst Scarlet Geraniums for bedding, C. Morel seems destined to become a great favorite. The trying season of 1901, with its alternate intervals of intense tropical heat for a few days, followed by a quite temperate spell for the same period, seemed unable to dim the lustre of its vivid scarlet flowers, or check it in its sturdy growth. Unless it develops some unexpected form of deterioration, the same as the Bruant geranium has of recent years, viz., in going back almost to a single flowering variety, C. Morel must have a place amongst the scarlet bedding geraniums.

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Alphonse Ricard is also a reliable variety, succeeding well under very adverse circumstances, its flowers also give us a pleasing relief with their soft orange shading. Raspail Improved I do not consider a good bedding variety, as it does not stand the sun well and is too upright in its habit of growth to make it a good bedding variety. Beaute Poitevine is a good, bright salmon, flowering kind, and succeeds well outside in summer.

For a pink flowering variety Jean Viaud can be recommended. Where this variety was tested last season it gave good results, stood the hot sun well, the flowers retaining their form and color even when severe heat and heavy rain storms sadly marred the beauty of many other varieties growing near it. The old dwarf-growing variety Waddington, that has deservedly earned for itself the name of "Pink Bedder," as well as many other synonyms, cannot yet be discarded from the list of pink geraniums. For a small bed or for ribbon effect this variety is, in my opinion, still unsurpassed as a bedder, but is of little use as a pot plant or for winter flowering purposes.

Amongst the lighter-colored double varieties, La Favorite, for a white is probably the best white-flowered bedding variety. Hermine, that produces its ivory white flowers in such profusion, when grown as a pot plant for the window or greenhouse in winter, is not adapted for a bedding geranium, the hot sun stunting its growth and often stripping it almost entirely of its small delicate foliage. Gloire de France, another good variety when grown as a pot plant, is also of very little use as a bedding variety. Its pretty pink and white flowers and its pretty marked foliage, however, make it still one of the best varieties for a window, or for the conservatory.

Amongst the single flowering kinds, Gen. Grant, for a scarlet, still holds a place, and is very effective when massed in large beds, or when used in ribbon or mixed borders.

Meteor is another good variety, not quite as intense in color as Gen. Grant.

John P. Cleary comes as near what is considered a perfect flower as any of the single flowering varieties, and where tested has stood the sun extremely well. A fully developed truss of this variety is a pleasing sight to all who love a soft orange scarlet flowering geranium.

Mrs. E. G. Hill is not yet surpassed for habit of growth and for producing a wealth of bloom under almost any condition of growth.

Dryden is a single flowering variety that promises well as a bedding variety. Its finely formed and beautifully blotched and tinted rose-red flowers, make it quite an acceptable addition to the list of single bedding geraniums.

Amongst the silver-foliaged geraniums there is nothing can outdo Madame Solleroi, especially as an edging or border plant. Mountain of Snow is about the only other variety of silver-edged geraniums worthy of growing as a bedding plant.

Tricolors and bronze geraniums cannot be included amongst the list of bedding geraniums, being far more difficult to succeed with than even the most delicate of our summer flowering begonias. As pot or window plants they still have a place, but are of too delicate a nature to succeed as bedding plants.

There are many more varieties of geraniums that could be spoken of as good bedding varieties other than those I have mentioned. Those that I have mentioned are varieties that will give good satisfaction with perhaps less care and attention than many other varieties; a fact that has influenced me materially in recommending them for out-door decorative purposes.

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HARDY ANNUALS.

By P. W. Hodgetts, Toronto.

Many of the annual flowering plants of our garden cannot, in our climate, be planted out before the first of June. These require greater warmth for the germination of the seed and growth of the young plant than is usually found in Ontario before that date and succeed best when raised in the house or in hotbeds and transplanted to their place in the flower beds when the really hot hot weather has set in. These plants are known as half hardy or tender annuals in proportion to the amount of cold they can stand and yet make a successful growth. Among these, are Asters, Verbena, Salvia, Dianthus or Pinks, Phlox and Lobelia. All of this class can be sown in the open ground, but not till the weather has become settled and warm. The hardy annuals are those, the seed of which may be planted as soon as the ground is ready in the spring, and which germinate rapidly and grow vigorously without the aid of artificial heat. Usually these are planted in April or May, depending on the length and severity of the winter, and the location of the beds where the seed is to be sown.

Now, just a few words as to the location and the preparation of the beds. Annuals, as a rule, make their best growth right out in the full sunshine, where they get all the warmth possible. Among the few exceptions are the pansies and forget-me-nots which seem to like the shadow, part of the day. For soils, we can by care and constant cultivation succeed with even the hardest clay, and some annuals will grow and thrive in places which are seemingly nothing but rock and sand. On account of their adaptability to all kinds of soil and conditions, the annuals are our favorite plants and bring cheer to many a home with their bright and sweet-smelling flowers. While growing thus under poor conditions, they more than repay the gardener who has the opportunity to use the best of soils and takes the trouble to prepare such in the best way possible.

The beds should be thoroughly prepared and manured as soon as possible in the spring, the whole surface being dug over to a depth of 10 or 12 inches, and the first few inches may often be profitably turned over again and then smoothed and levelled with a fine rake. A dressing of well-rotted leaf mold, sods and cow-manure will repay the trouble of procuring and applying the same. Anyone who intends keeping flower-beds year after year should make a practice of preparing a compost-heap in some out-of-the-way corner of the garden, and there should be thrown all the leaves and grass rakings, sods, weeds, and similar material from the lawn and beds, and it should be supplemented from time to time with a load of cow manure. This material when well rotted and mixed together forms the ideal application for the flower beds where you hope to grow your annuals.

To get back to our annuals again, we must get our seed selected. Purchase good varieties from reliable firms and buy the colors separate, so that in arranging the plants in the beds, one will know just what combinations of colors will be formed. The habit of the individual varieties should be known, as whether they are dwarf or tall-growing, spreading or erect, continuous blooming or otherwise. Plants which bloom for a short period only, may profitably be sown at intervals of ten days or more, so as to have a succession. Tall-growing varieties show best in the rear of borders or in the centre of other beds. Then the low-growing plants show off to better advantage, having the foliage of the taller-growing ones as a back ground. The same pleas- perennials in a border, where there is of necessity portions of the ground

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uncovered. Annuals generally are most effective when sown in masses with due appreciation of the colors to be in proximity. Many prefer the beds of one variety and many colors, as a bed of petunias or poppies: while others prefer the judicious use of a mixture of varieties either indiscriminately or in certain groups. At the Agricultural College last year, one long bed or border was laid out in blocks, each of which was planted with one variety and in most cases one color. No special care was exercised in the arrangement of the varieties, Calendula, Centaurea, Salpinglossis, Poppies, Phlox, Petunias, etc., following one another in seemingly endless variety. The effect was novel and yet pleasing as one looked down the long bed with its great variety of blossoms and foliage. As the early kinds blossomed and died away, they were at once replaced with others from the neighboring boxes or supply beds, and so the picture never faded all summer long, and was a never-ending source of pleasure to the thousands of visitors to the College during the summer.

A very pretty and attractive border may be formed by the use of the tall-growing perennials or even some of the annuals as a background with irregular groups and single plants of the annuals interspersed to form the foreground. In such a border, the correct use and combinations of colors and sizes determine largely the beauty of the whole, and much originality in these lines may be displayed there. The use of the hardy annuals for ribbon and pattern beds is not desirable, as they are, largely, plants requiring freedom of growth and not such as will withstand the clipping and trimming necessary for such artificial work. Their chief aim in life seems to be to produce beautiful flowers, not beautiful foliage, and they certainly succeed when given a fair chance.

Having prepared the surface of our beds, we take the first opportunity in the spring of putting in the seed. If the surface soil is apt to bake and form a crust, a slight sprinkling of sand will tend to remedy the defect and give the tiny seedling, when it springs up, a chance for life. Wherever seed is sown, a label should be placed at once to prevent destruction of the young plant during the weeding, which is sure to be required before the young plant is old enough to be identified. Very fine seed, as that of the poppy, may be sown right in the surface of the soil, while most seeds may be put down to a depth of three or four times their own diameter. As soon as the seed is in, the surface of the ground should be firmed by pressing with the hand or a flat board, to promote the supply of moisture at the surface of the soil and surrounding the seed.

A good many of our hardy annuals will not stand transplanting and should be sown where they are to grow and flower. Among these are the Poppies, the Lupines, the Mallows, and the dwarf Convolvulus or Morning Glory. Others only bloom for a short period, especially if the blossoms be left uncut, and with these a succession of bloom can be obtained by planting seed at intervals of ten days or a fortnight. With plants that will transplant readily, a good method is to raise them in beds or boxes, thinning them out and removing them to their places in the flower beds, as they get to the proper stage of growth. In this way, when the varieties that blossom and die off early are pulled up, other kinds of later blooming season may be put in to replace them, thus keeping up the beauty of the beds till the frost comes. With some varieties, as the nasturtiums and sweet peas, a constant picking of the bloom is necessary to prevent the premature dying of the plant, due to the strain necessary to produce seed. Indeed, this applies more or less to all annuals, and even extends to the fruiting of our orchard trees where, as is well known, excessive crops of fruit one year tend to weaken the trees so that no crop is borne the following season.

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Cultivation during the season is necessary to success in all lines of orchard and garden work and should be carried on continually during the summer weather in connection with the flower beds. After each rain, as soon as the surface is dry enough, get out your hoe or rake, and stir the soil about the plants. Do it frequently. It is better to err by doing it too frequently than not often enough. You will be more than repaid by the results, both in freedom from weeds and increased growth and health of the plants. Keep it up during the hot summer weather when the rain comes at rare intervals and the plants wilt from lack of moisture. It is surprising what a beneficial effect a simple stirring of the soil will then have in increasing the supply of moisture available for the plant roots.

Now just a few words on the annuals most suitable for us to grow in this country.

Climbers.

These we could not do without, as they form the standard covering for unsightly fences and porches, or for growing upon trellises to obscure the views of the back yard or garden.

The Morning Glories are still among the most popular for these purposes. They are noted for their hardiness and vigor of growth, and with their pretty, trumpet-shaped flowers of rich and varied colors, they will always be one of the most popular climbers. The tall or climbing Nasturtiums have of late years been superseded largely by the dwarf varieties for general bedding purposes, but are still worthy of a front place among our climbing annuals. They are luxuriant climbers or trailers and may be used with good results in hanging baskets. The new varieties include brilliant and varied list of colors, rose, salmon, scarlet, pink and white and either spotted, blotched, mottled or striped in numerous shades and combinations of colors. The Cypress Vine forms a very vigorous scarlet or white flowered climber. Another popular climber is the Canary Creeper or Canary Bird Flower. It is known for its fine foliage, and bright yellow flower shaped like a bird with spreading wings. This climber will grow to a height of eight or ten feet in good soil, and while not so hardy or vigorous as the others mentioned, is worthy of cultivation. The last in my list and perhaps the most popular is the Sweet Pea. On account of its hardiness and the extreme beauty, and sweetness of its flowers, it finds a place in every well-kept flower garden. Of late years great improvement has been made by Eckford, Henderson and Burpee in this plant, and their strains are now acknowledged to be the best.

Tall-Growing Annuals.

Among these are the Poppies, Centaurea, Calliopsis, Schizanthus, Salpiglossis, Calendula, Malope, Clarkia, Argemone and Larkspur.

The Poppies are vigorous growers attaining a height of 2 or 2½ feet before the end of the season, and where planted in clumps or masses make a splendid display. One of the prettiest single-flowered varieties is Miss Sherwood, a pink bloom of 3 to 3½ inches in diameter. Another very fine one is the well-known Shirley, which has a slightly smaller bloom in shades of pink, white and salmon. Then there are the double-flowered and fringed varieties in scarlet, pink and salmon. All of these are worthy of a place in our gardens, and are easily raised from seed but will not transplant readily. A border of these poppies in many shades and varieties was a great attraction during last season on the G.T.R. station grounds at Hamilton.

Centaurea Cyanis or as it is commonly called, Corn Flower, is one of our old favorite annuals. Most varieties grow to a height of 2 or 3 feet and

blossom freely, forming a good source of supply for cut flowers. The blue shades hold their color well while the pink and white shades soon fade. Among the good kinds are Emperor William, tall-growing and vigorous, and Victoria, a dwarf species growing in clumps and with small blossoms from 3-4 to 1 inch in diameter.

Calliopsis or Coreopsis is another splendid free-growing plant for cutting purposes. Many of the varieties reach a height of 3½ feet during the season and blossom continuously. As a cut flower it has few equals as it keeps fresh for such a long time on the table. Calliopsis elegans picta is a very pretty variety, with large red centre, and sulphur yellow border. C. Drummondii is of dwarf habit and slightly larger blossom. It is a very free bloomer with a small dark centre and golden yellow border. Other varieties of orange, yellow and brown shades may be obtained and are all good.

Calendula or Pot Marigold is another old favorite which has undergone many changes of recent years and is now much improved. The flowers, which run from 2 to 3 inches in diameter, are borne on long stems and when massed make a splendid show. The plants are vigorous growers and bloom freely, but the blossoms tend to grow smaller toward the end of the season. Meteor is an orange and cream-colored variety of good shape. Prince of Orange and Double Nankeen are both fine varieties with blossoms of brilliant orange and yellow shades. C. Officinalis ranunculoides is a distinct type, with broad orange-colored petals. Other varieties show varying shades of light yellow, orange, yellow tinted with orange, and greenish white but many of these do not hold their color and soon fade.

Malope grandiflora, a relative of the garden mallow, is another plant well worthy of a place among our annuals. It is not often seen in our garden being comparatively new. The plant is very vigorous and of spreading habit and bears many pretty bell-shaped flowers very useful for decorative purposes. There are two varieties, M. grandiflora, rosea and alba, rose pink and white respectively. The blooms of this plant, like the Calliopsis, are splendid keepers and are very useful as cut flowers.

Another of the useful plants furnishing flowers for decorative purposes is the Mexican Poppy or Argemone grandiflora alba. It was described by Mr. Hunt of the O.A.C. in the October number of the Horticulturist as follows: "Although the growth is coarse (3 ft.) the abundance of its pure white petalled flowers will especially commend it to florists as it gives an abundance of blossom during the month of August, if sown in the open border in April. This plant has a habit of closing its flowers when on the plant at night and during dull weather, but when cut, they remain open constantly. Although the stamens in the centre of the flower are yellow, it is of such a soft shade and texture that this feature is not as objectionable as it is for florists' flowers. For short time work it ought to be of value to florists, as large white flowers are so scarce oftentimes before the Asters make their appearance."

The Salpiglossis, another tall-growing annual, produces flowers which for richness of color can hardly be matched. The flowers vary from 1½ to 2 inches in diameter and are shaped somewhat like the Nasturtium blossom. S. variabilis coccinea has small blossoms of a maroon color with gold splashed throat. S. variabilis albo-lutea has larger flowers of pale yellow turning to white at the edges. S. variabilis venosa is very fine with purple blossom and orange-tinted throat. S. variabilis nigra, as the name implies, is very dark maroon with prominent yellow stamens. S. variabilis rosea is also an excellent variety with rose pink blooms.

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Clarkia in two varieties, pulchella and elegans, furnish an abundance of many colored flowers of single and double forms. The blossoms are of brilliant hues and odd shapes and when the plants are massed, the bloom completely hides the foliage. C. pulchella is a low-growing single variety, while C. elegans is tall and double.

Schizanthus is another free blooming plant which makes a fine show for a short time in July and August and then dies off rapidly. Like Clarkia it comes in many shades and forms a mass of bloom above the plants themselves. The blossom is small and peculiar in shape giving the name Butterfly Plant.

The Larkspurs or Delphinium are well known as perennials and deserve attention as annuals also. The flower spikes grow from 3 to 4 feet in height and are splendid plants for the background in borders. There are several pretty colors, light and dark blue, white and pink being most prominent.

Another tall-growing annual of use for cut flowers is the Chrysanthemum. Like the Larkspur, it is more known as a perennial and green house plant. The annual however has been much improved of late and some of the markings are especially fine. By sowing the seed early, an abundance of flowers will be produced in August and September, and these will be found very useful for table and home decoration.

Low-Growing Annuals.

Among these, the best are Portulaca, Mignonette, Candytuft, Shortia, Eschscholtzia, Viscaria, Xeranthemum, Hawkweed and Cacalia.

The first three are old favorities and are so well known as hardly to need description. Portulaca can now be obtained in very pretty colors, either pure or mottled and spotted, bronze, pink, carmine, rose, sulphur yellow, golden yellow and pure white. Portulaca Beddmani has a very pretty pure white blossom. All the colors can now be obtained separately and make a better show than when mixed.

Of the Mignonettes, one variety known as odorata grandiflora, produces a fine and fragrant flower spike. Other good kinds are Glory of Anjou and Allen's Defiance.

Among the varieties of Candytuft the dwarf whites generally give the best effects. Little Prince is a free bloomer, pure white, vigorous and spreading with flower spikes over an inch in diameter. Another dwarf is White Empress with large and showy spikes. Another variety "New Carmine" has spikes of carmine hue and plants of higher growth.

One of the newer annuals is Shortia Californica, a low spreading plant with fine cut foliage and poppy-like blossoms of bright, yellow color. It is a free bloomer and vigorous grower.

Another annual, Eschscholtzia, or California Poppy, produces pretty blooms of golden, rose and cardinal shades. It is a showy plant with large blooms, is very vigorous, and is well worthy of a trial. It will not stand transplanting and needs plenty of room to grow, but once established furnishes a succession of bloom all summer. E. Californica is one of the older varieties. Golden West produces single golden yellow flowers. E. alba plena is a double white kind, while Rose Cardinal is, as the name implies, a rich rose color.

Viscaria, another desirable annual, has a growth like the pink, and a small bloom of mixed pink and white color. The growth is vigorous and pretty, and the plant spreading, and well worth having in the border.

Xeranthemum annuum is a type of the everlasting flowers, and its pretty blossoms may be cut, and kept like the wild everlasting. The blooms show

several shades of pink and white, and are from 3-4 to 1 inch in diameter. The plant is easily grown and is quite hardy.

Hawkweed is a pretty annual with a bad name. It is practically a pink dandelion, giving a profusion of bloom, and lasting almost all season. It should not be allowed to get out of the garden, as it might, like the yellow dandelion, become, as the name implies, a weed.

SOME PERENNIALS I HAVE GROWN.

By Major H. J. Snelgrove, Ph. B.

All who have read Ernest Seton-Thomson's charming book, "Some Wild Animals I Have Known," could not fail to be fascinated with the moral beauty of the animal character which he portrays so vividly in such four-footed heroes as the Pacing Mustang, his dog Bingo, or Raggylug, the Cottontail Rabbit. Such a graphic history of animal life brings us in closer kinship and warmer sympathy with the highest forms of nature.

As a lover of flowers, I would fain wish that some great artist would do for our fair garden favorites what Ernest Seton-Thomson has done for the wild animals, by investing them with moral attributes, and presenting psychological pictures of the most beauteous forms of plant-life. To illustrate my meaning, let me quote the pretty story of the Briarbush which Raggylug learned from his mother :

"Long ago the roses used to grow on bushes that had no thorns. But the squirrels and the mice used to climb after them, and the cattle used to knock them off with their horns, the possum would twitch them off with his long tail, and the deer with his sharp hoofs would break them down. So the Briarbush armed itself with spikes to protect its roses and declared eternal war on all creatures that climbed trees or had horns or hoofs or long tails. This left the Briarbush at peace with none but Molly Cottontail, who could not climb, was harmless, hoofless and had scarcely any tail at all."

It was Henry Ward Beecher who said :—"Flowers have an expression of countenance as much as men or animals. Some seem to smile; some have a sad expression ; some are pensive and diffident; others again are plain, honest and upright, like the broad-faced sunflower and the hollyhock."

Cowper truly wrote : "There is not a flower but shows some touch, in freckle, streak or stain, of God's unrivalled pencil."

I presume that each one here present may be regarded as an interpreter of the divine language of flowers and so can say with the poet :

"Sweet letters of the angel tongue,
I've loved ye long and well,
And never have failed in your fragrance sweet
To find some secret spell—
A charm that has bound me with witching power,
For mine is the old belief,
That midst your sweets and midst your bloom
There's a soul in every leaf."

But my task on this occasion must necessarily be more practical than poetical. It is my intention to describe a few of the best hardy perennial flowers which we have successfully introduced to Cobourg gardens through the distributing medium of the local Horticultural Society. It has always been our policy to foster as much as possible the cultivation of perennials, because we find that although the initial expense may be a trifle greater than the cost

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of annuals, yet the results are so infinitely more abiding and satisfactory as to repay us fourfold for any extra expense at the outset.

In passing, I would say that many of the ancient flowers which had an honored place in our dear mother's old fashioned garden are not surpassed to-day by the latest novelties imported from foreign nurseries. Who does not remember with fond delight the clumps of tear bedewed Bleeding Heart, the flaming red "Pinies," the gaudy Tiger Lilies, or the bonnie bushes of Prairie Rose and Flowering Almond beside the garden gate?

Poor Tom Hood's sweet song touches tenderly the heartstrings of every old boy:

"I remember, I remember,
The house where I was born;
The little window where the sun
Came peeping in at morn * * *
* * *
"I remember, I remember,
The roses red and white,
The violets and the lily cups,
Those flowers made of light!
The lilacs where the robin built
And where my brother set
The laburnum on his birthday—
The tree is living yet."

But while revering the old flowers, we are behind the age if we do not recognize the fact that to botanical exploration and hybridization which have been prosecuted with indefatigable enthusiasm in all the older countries especially are we indebted for many new varieties, whose blossoms are beautiful to behold.

I use the word "perennials' as a short form of the phrase, "hardy herbaceous perennials," which are non-woody plants, whose roots live over the winter from year to year while their tops as a rule die down to the ground. Nearly all perennials should be lifted now and then, because the crowns which produce the flowers bloom only two or three seasons and then die and unless lifted and divided the stocks become unattractive. Another good reason for lifting and resetting is that, being mostly strong rooted plants, they are sure to impoverish the soil.

The following well-tested species are described alphabetically, not in order of preference:

1. Achillea, whose virtues are said to have been discovered by Achilles, The Pearl is a gem among border flowers, and most useful for cutting, especially for cemetery decorations. Its double white blooms are exquisitely pure in color and very numerous on the stalk. Its culture is easy.

2. Anemone (Windflower). This showy plant flowers from spring till autumn. The Japan Anemones are invaluable for cut flowers, being stately plants for mixed borders. Alba and Coupe d' Argent are the finest of fall bloomers. They thrive best in fresh, rather rich sandy loam.

3. Aquilegia (Columbine) from Latin Aquilegus, the water drawer, is one of the most beautiful and popular of all hardy plants. It is best propagated by seed, which is slow in germinating. Aquilegia Corrulea, the Rocky Mountain Columbine, should have a place in every border. The flowers are of the most lovely and delicate sky blue and white, with very slender spurs tipped with green. Light sandy soil, moist with good drainage, sheltered but exposed to the sun, is what this elegant plant prefers.

4. Campanula (Perennial Bell Flower). There are about 300 species of this genus, for the most part of great beauty and invaluable as cut flowers. The Canterbury Bell is the most popular of all Campanulas. Although

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England is the natural home of this garden favorite, its cultivation is easy in this country, where it can be grown from seed in any rich, well-drained sandy loam. The dwarf varieties are fond of rockeries.

Platycodon Grandiflorum, a handsome species of the Campanula, is found growing wild in China and Japan. Its blue or white bell-shaped flowers are very desirable. The stems should be kept tied up during the season and they should be allowed to die off naturally in the autumn, otherwise the crown may be injured.

4. Centaurea, a showy border plant of easy culture in ordinary garden soil, flowering during the months of July and August. Atropurpurea, royal purple; Declinata, pink; and Macrocephala, yellow, produce striking specimens of these thistle-shaped flowers.

5. Coreopsis Grandiflora. A golden yellow perennial which should be grown far and wide. It is fine for cutting and easy of culture.

6. Delphinium (Perennial Larkspur) named after the dolphin, an animal which it is said to resemble, is one of the most beautiful of all flowers and of rare value for cutting purposes. It is gorgeous in color and stately in habit. I know of no flower which exhibits more splendidly the various shades of that Imperial color, blue. The Forget-me-not is loved for its fresh azure; the Gentian for the shade which is called by its name. The Delphinium possesses both of these in its repertoire of tints, together with the depth of the sapphire and the hue of purple; and as the mountain snows shine more resplendent in a setting of blue sky, so the striking white central petals of the Delphinium form the best of all possible contrasts to the color of the surrounding sepals. It is almost impossible to convey anything like an adequate idea by mere description of perfect columnar spikes of bronze blue which are freely borne by the Delphinium. During the past decade this splendid flower has been improved out of recognition, being prolific in new varieties. The culture of this popular perennial is exceedingly simple. A rich friable loam will suit it finely, but any soil even hot and sandy, if well watered and manured and exposed to the sun will give excellent results. Deep preparation of the soil is important. This perennial may be propagated by root division or by cuttings. An avenue of Delphiniums lining a walk or a drive is a grand sight.

7. Digitalis (Foxglove). Latin digitus, finger, is a fine genus of half hardy plants. Their long inflated flowers suggest spires or towers of bells; the strong vertical lines of their flower stalks rising from rich and luxuriant masses of cauline leaves, giving always an appearance of strength to the rambling outline of the herbaceous border. This is old-fashioned and dignified, but wholesome company in the choicest garden. The popular name, Foxglove, is said to be a corruption of Folk, meaning little folk or fairies. A light well-enriched soil, not too dry, and impartial shade, suits it admirably.

8. Doronicum Plantagineum Excelsum, (Leopard's Bane). This is one of the best and most satisfactory of herbaceous plants. It commences to blossom early in the year, and continues till late in the autumn. The flowers are borne upon long straight stems high above the basal crown of foliage which render them very convenient for cutting. I have seen them fresh and unfaded after being in water ten days. The marguerite-shaped flowers, with long narrow rays, are of the brighest yellow. It succeeds well among shrubs as well as in borders.

(9) Gaillardia Grandiflora. Among hardy perennial plants Gaillardias are conspicuous for perpetual profusion of flowers from June to November. The abundant blossoms produce a gorgeous effect in borders. Thanks to the

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careful selection of the hybridizer, there has been a vast improvement in size, form and range of color on the old varieties of Gaillardia. It is highly recommended for cutting purposes, as the flowers will last for a long time in water, and can be cut with ample self-supporting stems. It is content with simple treatment, but thrives best in light, open, well-drained soil, and should have the full benefit of sun and air.

(10) Iris (Greek word for rainbow). The beauty of the Iris is proverbial. The rhizomatous varieties belonging to the Germanica family are large, stately and fragrant, exhibiting beautiful variegations of color. They delight in deep, rich soil. Coal ashes will protect the rhizomes during the winter.

(11) Lobelia. Few plants are more effective or richer in color effects during their blooming season than Lobelia Cardinalis, or Indian Pink, one of the most showy of all native flowers ; Lobelia Syphilitica, purple; or Lobelia Firefly, brilliant scarlet. As the native Lobelias inhabit wet, low places, the best results under cultivation are to be expected in moist, cool spots, soil deep and rich, with good drainage.

(12) Lychnis. No garden, however small, should be without some representatives of this favorite perennial. The little dwarf Alpina, with its pink, star-like flowers begins to bloom in April, and continues until the hot weather sets in. Chalcedonica, whose petal limbs resemble a Maltese cross, probably of Japanese origin, brick red to scarlet, is one of the most distinct and desirable, growing about three feet high. Another approved variety is Vesuviana, whose large, double white flowers are produced in great profusion all summer, taking the place of Carnations when white flowers are scarce. Splendens is a distinctly new and beautiful variety, whose large, double blossoms of a bright firey rose color are arranged very closely. They are of the easiest culture in ordinary garden soil. Several species of Lychnis are among the best known of old-fashioned flowers, such as the Mullein Pink and Ragged Robin.

(13) Papaver Nudicaule. The glory of the arctic regions. Iceland Poppies are admirable for the front of a mixed border or in a small bed by themselves. Their graceful, brightly-colored, cup-shaped flowers, borne on long, naked stems, are invaluable for cutting for the table. As a perennial the P. Nudicaule is short-lived while the Oriental Poppy is long-lived. The latter produces immense numbers of the most gorgeous flowers of great size and wide range of color, creating a magnificent effect. Oriental Poppies may be massed in the border, grouped on the lawn, or mixed with shrubbery.

(14) Paeonia. The Paeony is the fashionable flower par excellence. Botanical historians tell us that the plant derives its name from Paeon, a physician and erstwhile disciple of AEsculapius, the god of healing. The ancient legend runs that Paeon cured Pluto of a wound received from Hercules, and when this fact became known to AEsculapius, it aroused feelings of jealousy within his breast to such an extent that he secretly killed Paeon. Pluto, out of gratitude to Paeon for saving his life, determined to perpetuate the latter's memory for all time by changing him into a flower, henceforth to be known as the Paeony. Herbaceous Paeonies are, in my opinion, the noblest and grandest of all the hardy perennial plants. The cut flowers, produced in great profusion, in an almost endless variety of lovely tints, are unrivalled for decorating vases and bowls. In delicacy of tint and fragrance, the Paeony more easily approaches the Rose than any other flower. To show the wonderful development that the herbaceous Paeony, which justly claims the title of "Everybody's Flower," is capable of undergoing, let me say that in 1855

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only 24 double varieties were known. Now more than 1,000 varieties are grown. The single-flowering kinds are not so popular as the double ones, because they do not keep as long when cut, and fade more rapidly when on the plant. They will grow in all kinds of soil, but do best in a deep, rich, rather moist loam. They are gross feeders. An annual top dressing of cow manure, put on in November, should be forked in in the spring. The roots should be watered, especially when in bloom. Liquid manure will give good returns. Paeonies have nothing to fear from pests, not being attacked by any insect, animal or fungous disease, neither do they require any covering from the severest weather.

(15) Autumn Phlox. Their neat habit, bright-colored flowers, profuseness of bloom, and ease of culture make herbaceous Phloxes favorites everywhere. Among these beautiful hardy perennials the colors are most frequent in reds, but there are many charming purple, white, violet, and parti-colored varieties. The Autumn Phlox will thrive with little attention, but should be renewed by dividing the clumps in the fall, after growth has ceased. By this process the plants do not become weak and hidebound.

(16) Pyrethrum. A handsome member of the famous Chrysanthemum family. Nothing can surpass the almost infinite variety of the Pyrethrum, which is deservedly becoming more and more popular in this country. The Aster or Chrysanthemum-like flowers are bright and showy in the garden, and elegantly borne on long stems, most convenient for vase decoration. In fact, they are absolutely invaluable for cut flowers from spring to autumn. Flowers succeed flowers without stint, and the blossoms are not injured by storm or sun. They grow freely; any good garden soil will suffice for them, but they are rich feeders, and, therefore, the ground should be deeply dug and liberally enriched with manure. The ideal soil for the Pyrethrum is rich, sandy loam, sufficiently porous to prevent stagnant moisture accumulating about the crowns of the plants, because crown-rot will make sad havoc with them. Over 400 varieties have been catalogued, embracing most varied shades of color, from the purest of white to the richest of crimson, and even yellow.

(17) Rudbeckia "Golden Glow." It was in 1896 that J. L. Childs found this double-flowered Rudbeckia among some wild plants that had been sent to him by a correspondent. It has been pronounced the best perennial of recent introduction. It is of striking habit, distinct foliage and prolific bloom, beginning to flower early in July and continuing all through the summer. It frequently attains a height of seven feet. Its large, yellow flowers are produced in immense quantities on long stems, and resemble fine golden Cactus Dahlias. As a cut flower it is unsurpassed. If cut back severely when through blooming and well watered, it often produces a second crop of flowers. Being a vigorous grower, it should be assigned to a sunny corner, where it can reign alone the proud monarch of the border.

HARDY DECORATIVE SHRUBS AND PLANTS.

By Wm. Hunt, Superintendent Greenhouses, O. A. C., Guelph.

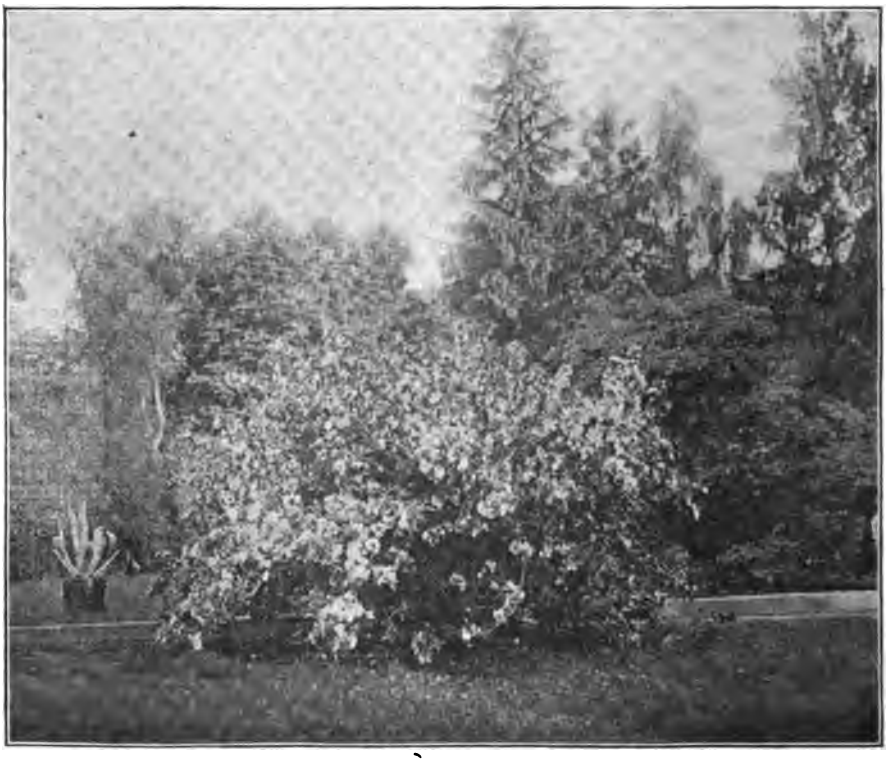
The selection of a suitable list of ornamental shrubs and plants for lawn decorative purposes is oftentimes a difficult matter for those who wish to beautify the surroundings of their home with these permanent occupants of the lawn or flower garden.

A bed of annuals or of greenhouse plants, if not a success during one season, can easily be changed the following season to something more ap-

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propriate. Not so with hardy decorative shrubs, climbers, etc. These take a year or two, at least, before they even commence to show anything like their true characters of form and habit, and their suitability; or, as is too often the case, their non-suitability for the positions they are to occupy—that is, when badly selected. Too little care and forethought is generally exercised in the selection of these plants by the majority of amateur landscape gardeners.

How often can be seen some of the most beautiful varieties of flowering shrubs, such as the Tartarian Honeysuckle, Syringas (Mock Orange), Lilacs, Cydonia Japonica, and many more of the larger growing shrubs, planted in positions where they can never have an opportunity to make the



Weigela Rosea.

grand specimens they are capable of making, and develop their full beauty of form and flower. The average-sized lawn, as generally seen at the present time attached to villa residences, or the grass plot in front of the farm house, is no place for the stronger growing class of shrubs I have mentioned, unless, perhaps, to hide some unsightly building or fence. The central portion of small lawns, at any rate, should not be planted with these large specimens of shrubs; possibly one or two might be planted on the margin of a fair-sized lawn, without undue crowding or obstructing the view too much. A large shade tree or two, however, would be far more preferable, planted in the open lawn, than large-sized shrubs, besides being more useful as a summer shade; and would not have the same unpicturesque appearance that some ornamental shrubs present, when not in flower.

Take, again, the conifers and evergreen trees and shrubs. How often

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do we see specimens of the tall-growing Norway spruce fir, and the common red cedar, planted quite thickly on lawns of small dimensions; where, in a short time, they have to be clipped severely every year to keep them from monopolizing the whole lawn. This clipping not only destroys the beautiful symmetrical form of these trees, but gives them a decidedly rusty-looking appearance during the greater part of the year, besides being a constant source of expense and trouble to keep them in shape.

The proper position for the stronger growing pines and cedars, if used near a small lawn at all, is to use them as wind-breaks, or as marginal screens, to hide from view some objectionable feature of the landscape in the background. I am aware that these cannot be classed as shrubs, but as



Lilac, Charles X.

so many of them are planted on lawns, and often present such an objectionable appearance, I could not refrain from mentioning them in this connection.

I do not wish to depreciate in the least, by the remarks I have made, the grandeur and beauty of the larger growing conifers and evergreen trees, as well as the shrubs, I have mentioned. Given their proper positions and environments on large lawns, or in parks of great extent, or in positions where they can each fully develop their individual beauties of form and flower, there is no class of trees and shrubs that will add more grace and beauty to landscape scenery than the many varieties to be found amongst the tall growing conifers and the flowering shrubs before named.

I have been tempted to condemn, as strongly as I have done, the in-

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judicious planting of these trees and shrubs on small lawns, from the fact that one sees so many otherwise beautiful and attractive lawns entirely spoiled by the planting of unsuitable trees and shrubs. Just a word here to the nurserymen in this respect. "If more detailed descriptive matter, as to the habit and growth of trees, etc., were given, rather than such highly-colored plates and flowery descriptions often made use of in catalogues, there would be far fewer disappointments and comparative failures, and, as a natural sequence, there would be a greater demand for this class of nursery stock."

There is nothing, however, that adds more to the home-like appearance of even the most unpretentious residence than a well-selected and judiciously



Large-flowered Syringa.

planted collection of ornamental and decorative shrubs, to say nothing of hardy climbers and perennial border plants. Planted around the margin of a lawn, either singly or in a border, they give a look of permanency, as well as a constant succession of color and blossom, that annuals and most summer plants fail to do, desirable as these latter are.

I have selected the following list of varieties of flowering shrubs, with a few short descriptive notes as to habit of growth, as well as time of flowering, suitable for planting around and on small lawns:

1. Forsythia intermedia: A variety of the Golden Bell Flower; hardier than the other Forsythias; flowers early in spring, in April or early in May;

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will grow to a height of five or six feet, often occupying a space of four or five feet in width. One plant will brighten up a whole lawn with its golden drooping flowers.

2. Spiraea prunifolia flore pleno : Double white flowering spiraea. Very free flowering; will grow to a height of four feet; flowering period, about the end of May. Makes a splendid specimen plant.

3. Diervilla or Weigela rosea: Four feet high; flowers in June.

4. Diervilla or Weigela Mons. Lemoine: Similar to D. rosea, but considered to be hardier ; June. Cannot be dispensed with in even a small collection of shrubs.

5. Caragana arborescens: Siberian Pea Tree, 5 to 6 feet. July. Very hardy.

6. Prunus flore albo. pleno: Double flowering almond, 3 feet; May. Fine for use in the foreground.

7. Spiraea Van Houttei : Four feet ; flowers early in June ; one of the best varieties. Graceful drooping habit.

8. Deutzia gracilis : Very dwarf habit ; 2 feet ; flowers about second week in June. Can be planted near the edge of a walk or border.

9. Spiraea Thunbergii ; One of the earliest flowering spiraeas, being often in flower early in May. Of dwarf habit, 3 feet; makes a pretty globular shaped shrub. Foliage very pretty and effective in autumn.

10. Hydrangea paniculata grandiflora: Large specimens, sometimes 3 or 4 feet in height. Produces its large, creamy white panicles of flowers in August and September, that often last until early frosts. Hardy. The flowers of this plant can be cut before severe frosts, and placed in a vase without water, where they look bright and nice the whole winter.

Evergreens.

Amongst the dwarf conifers and evergreens for planting on lawns, the Junipers and Thuya (Arbor Vitae) furnish the most desirable varieties; Juniperus suecio nana, or Swedish Juniper, and J. Hibernica, or Irish Juniper, being two good kinds. These will grow to a height of five or six feet, or perhaps more, and are of very erect conical habit. Fine for the centre of a lawn, as they do not materially obstruct the view.

Amongst the Arbor Vitae, the variety Little Gem is perhaps the dwarfest and prettiest, having dark green foliage, and attaining a height of only about two feet usually ; makes a good lawn hedge.

Thuya compacta and T. globosa are both good hardy varieties of dwarf habit, and pretty foliage, making nice globular-shaped specimens about 3 ft. high.

Thuya Tom Thumb is a splendid dwarf variety, suitable for a hedge, or for planting singly on lawns.

Amongst hardy evergreen shrubs, the dwarf growing Mahonia aquifolium is the most hardy. A shaded position suits this shrub best. Its foliage is a good substitute for holly at Christmas; it is often called Canadian holly.

Many of the more tender Cupressus, Thuyas and Junipers of Eastern origin might be recommended for parts of Southern Ontario, but their hardiness in the northern districts is very doubtful.

Climbers.

Amongst varieties of Clematis, many of the beautiful varieties of the Jackmanni type can be recommended for Southern Ontario, and for favored spots farther north, but cannot be classed as really hardy. They are, how-

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ever, easily protected in winter. There is one variety of Clematis, however, —a native of Canada and the States—not generally known, that makes a splendid covering for a wire trellis, or even a picket fence, viz., Clematis Virginiana. When covered in July or August with its large clusters of small white flowers, it is a pretty sight, the flowers contrasting beautifully with its clear, glossy green foliage. A vase of its star-like blossoms and tri-lobed dark green foliage makes a most acceptable ornament for the table or mantel during the hot months of July or August, when flowers are often very scarce. It will succeed in almost any kind of soil, and is not particular as to the aspect, as I have found it flourish on the north side of a building equally as well as on the south or east side.

The Clematis vitalba, or Travellers' Joy, is another hardy and desirable variety for trellis work, or any position where a real hardy climber is required.

Possibly a much larger collection of desirable hardy shrubs and plants might be made, but those I have recommended can be relied upon to give good results, if only ordinary care is taken in their planting and after management.

And now, a word or two on the planting and pruning of flowering shrubs:

Each shrub should be planted so that it has room to develop and mature itself into a perfect specimen, without there being any necessity for the needless and detrimental practice of clipping flowering shrubs. All the pruning that these shrubs require can, if commenced when the trees are young, be done by thinning out here and there the most prominent shoots and branches. This can be done in the fall or early spring, or, in many cases, when they are in flower, without harm to the plants, if not thinned too severely. These summer cuttings will supply good decorative material for the table or for jardinieres indoors.

The clipping process, before referred to, should never be permitted, as it removes about all the flowering wood for the next season. When tempted to apply the clipping shears to flowering shrubs, endeavor to picture to yourself the wood that you would remove, covered as they would be in summer time with their loads of blossoms, and you will refrain from applying the shears to them. Better to leave them untouched, than to clip and mutilate them so as to make them unsightly and useless for decorative purposes.

If a marginal border is decided on for the planting of the shrubs I have named, add a few clumps of hardy perennials dotted here and there, so as not to unduly crowd either shrubs or perennials, as the latter spread rapidly when established. A good list will be found in the following kinds that will give a succession of blooms from April until October or November: Dielytra spectabilis, or Bleeding Heart; Aquilegia Oxysepala and A. chripantha, Campanula persicifolia alba, Gaillardia grandiflora, German Iris in variety, Paeonies in variety, Spiraea filipendula alba pleni (double Spiraea), Achillea (the Pearl), Hemerocallis flava (Lemon Lily). Add to this a few varieties of Perennial Phlox, and you will have a bright looking lawn the whole summer. A few clumps of Lilium Tigrinum, or Tiger Lily, and the Lilium candidum will complete a useful, showy, and hardy list of shrubs and plants for the decoration of any moderate-sized lawn, that will give pleasure to the owner and to all who see them.

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CANADIAN MAPLES.

By W. T. Macoun, Horticulturist Central Experimental Farm, Ottawa.

If there is one Canadian tree which is known to young and old it is the maple. That patriotic song, "The Maple Leaf Forever," is one of the first which the little children learn to sing at school; and often it is sung in the refreshing shade of the maples on a hot June day, when the value of the maple as an ornamental shade tree is pointed out to the scholars by the teacher. Then, the maple sugar and syrup in the early spring impress the maple on the minds of Canadian youth more than perhaps anything else. Those of maturer years sing the same song, enjoy the same shade, and many also the sweets of the sugar maple. The latter also admire the form and foliage of the trees and the economical value of the wood for furniture and other purposes. The emblem of Canada is thus well and favorably known to young and old.

While almost everyone, from the little child upward, is familiar with the maple, comparatively few, especially in our cities and towns, can distinguish the common species from each other, and still fewer know all the species which are to be found in Canada. It is in the hope of making the different species better known that these notes are written.

There are ten native species of maples in Canada, all of which are perfectly hardy at Ottawa, with the exception of the Large-Leaved Maple (*Acer macrophyllum*) which kills outright, and the Vine Maple (*Acer circinatum*) which, although it becomes hardier from year to year, cannot be called more than half-hardy.

Six of the species grow to be large or medium sized trees, while four are but small trees or shrubs.

The technical descriptions given in this article are taken from the "Cyclopædia of American Horticulture," as they are simpler and more concise than those found in botanies; but the nomenclature is principally that used in the "Catalogue of Canadian Plants" (Macoun), which is most familiar to readers of the "Canadian Horticulturist." These changes have been made in the names, but both old and new are given. The illustrations are from photographs kindly furnished by Mr. F. T. Shutt.

1. Sugar or Rock Maple (*Acer saccharinum*, Wang; *Acer saccharum*, Marsh).—"Large tree, 120 feet, with bark; leaves 3-5 lobed, cordate, 3-6 inches long, with narrow and deep sinuses; lobes acuminate, sparingly dentate, usually glaucous and glabrous beneath; fruit with little spreading wings." It is found from Nova Scotia to the western end of Lake Superior, and in scattered places to the Lake-of-the-Woods and northward to Lake St John, Lake Temiscamingue, and to the long portage on the Michipicoton River, north of Lake Superior. It is the most valuable and one of the most beautiful of all Canadian maples. It is one of our best timber trees, the wood being highly esteemed for many purposes. Being hard and tough, it is used where strength is required, as for axles of wagons, handles of tools, etc., and, on account of its fine grain and the fact of its taking a good polish, it is much utilized in furniture making, the well known Bird's-Eye Maple being obtained from this species. As fire wood, the Hard Maple has few equals, and many a log has warmed Canadian homes on wintry nights. The sap of the Sugar Maple gives it a unique place among Canadian trees, for although other trees yield sap which may be converted into syrup or sugar, there are none which produce it which equals the Sugar Maple in richness and palatability. Sugar making is quite an important and profitable industry in some parts of Ontario and Quebec, and the supply of pure syrup and sugar never seems to equal the demand. The continued tapping of the trees does not

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appear to lessen the vigor of them, and trees which have yielded many a quart of sap live through several generations of tappers. It is as a shade tree, however and on account of its brilliantly colored foliage in autumn, that the Sugar Maple is best known to those living in cities, towns and villages. For street purposes it stands without an equal, being of fine shape, dense foliage, comparatively free from insect pests and fungous diseases, and long lived. In October the foliage of this species and the Red Maple assume those varied, delicate, and gorgeous tints which help to give such character to our forests, brightens up our city streets, and give autumn a gayness which the falling leaf alone dispels.

The Sugar Maple thrives on almost all kinds of well drained soil, but makes little growth where the ground is constantly wet and cold.

2. Black Maple (*Acer nigrum*, Michx; *Acer saccharinum nigrum*, Torr & Gray).—"Large tree, 120 feet, with black bark; leaves cordate, with sinus mostly closed, generally 3-lobed, with broad sinuses, the sides of the blade mostly drooping, green and pubescent beneath; lobes acute, entire or obtusely toothed; fruit with diverging wings."

For a long time this was regarded as merely a variety of the Sugar Maple, but it now ranks as a distinct species, and rightly so, for it has quite a different appearance from the former, and is fairly well distributed throughout Ontario, from Ottawa westward. It is not as attractive a tree as the Sugar Maple, the foliage being much duller, but it makes a striking object, as the leaves differ so much from the other large maples, the lobes being almost or quite entire. The wood of this tree ranks next to the Sugar Maple in quality. This tree also yields sweet sap, but is not used in sugar making to any extent.

Red, Scarlet or Soft Maple (*Acer rubrum*, Linn).—"Large tree, 120 feet; leaves 3-5 lobed, 3-4 inches long, green above, pale or glaucous beneath; lobes unequally and crenately serrate; flowers red or scarlet, rarely yellowish; petals 5; fruit glabrous."

The range of this maple in Canada is from the Atlantic Ocean west to the Rainy River and a little further north than the Sugar Maple.

The Red Maple is not as useful a tree as the Sugar Maple. Although a prominent Canadian tree, its value for timber, fuel and sugar is not nearly equal to the other, but it is quite, if not more, ornamental. Beginning in the early spring before the leaves make their appearance, the scarlet blossoms, which are so profusely borne, brighten our streets at a time when they are much appreciated, and in the month of June the bright red fruit continues to make this tree attractive. It is, however, in the autumn that it shows to best advantage, when the leaves take on the bright scarlet and lighter hues which make the maples famous. Odd trees will be found assuming bright tints early in the autumn, and the contrast between these and the deep green of the surrounding foliage is very marked.

When the soil is suitable, the Red Maple makes quite as good a tree for streets and parks as the Sugar maple, but often it is planted in ground where it will not thrive and it dies before reaching its prime. This tree, unlike the Sugar Maple, does best in wet soil, and is found in the wild state in swampy land or bordering lakes and rivers, being often called the Swamp Maple. Large numbers of the Red Maple are planted as shade trees in our cities and towns, and where the soil is moist they succeed well, but if the soil is naturally somewhat dry, and becomes dryer where permanent walks and roadways prevent air and moisture reaching the roots of the trees, they gradually sicken and die. Many such trees may be seen in the City of Ottawa to-day.

4. Silver or White Maple. (*Acer dasycarpum*, Erhr; *Acer saccharinum*, Linn.—" Large tree, 120 feet; leaves deeply 5-lobed to 5-cleft, 4-6 inches long, green above, silvery-white beneath; lobes deeply and doubly serrate; flowers greenish-yellow, apetalous; fruit pubescent when young."

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The Siver Maple is not as well distributed as either of the preceding species. It is found in New Brunswick in a few places, and is quite rare in the Province of Quebec, but is abundant in the Province of Ontario. It appears to succeed farther north than either the Sugar Maple or Red Maple, a few specimens planted near the Canadian Pacific Railway at Portage la Prairie, Man., being quite hardy. It has also been planted at Brandon, Man., and although not perfectly hardy does not always kill outright.



Smooth Maple.
(*Acer Glabrum*, Torr.)

This tree is less valuable than the Red Maple for timber or fuel, being very soft; nor does it color as highly in the autumn as either the Red or Sugar Maple, but it is a more graceful tree than either of the others, being of more spreading habit and having more finely cut foliage. Like the Red Maple, this species thrives best in moist ground, and where the conditions are favorable attains a great size. It is a very rapid growing species, and on this account is often planted in preference to other kinds.

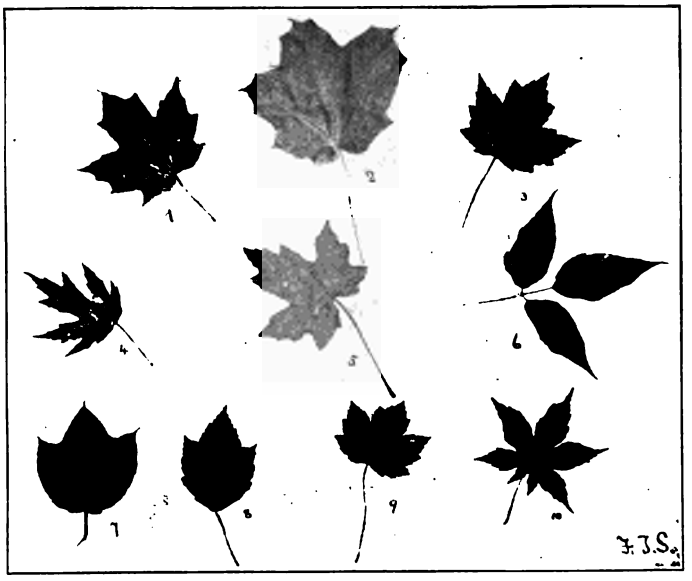
The Silver Maple blooms earlier than the Red Maple, but the flowers are not so attractive. The fruit, which is of large size, ripens about the middle of June, at Ottawa, and is very noticeable when lying on the footpath. There is a well known cut-leaved pendulous variety called Wieri which is a very graceful tree.

5. Large-Leaved Maple (*Acer macrophyllum*, Pursh).—"Tree 100 feet high; leaves cordate, deeply 3-5 lobed or cleft, pubescent when young, pale green beneath, 8-12 inches across, middle lobe mostly 3-lobed; racemes pendulous; fruit with yellow, bristly hair, largely winged."

The Large-Leaved Maple is confined to the Province of British Columbia and is only found there in the valleys along the coast in the southern part of the province and on Vancouver Island. It is a majestic tree, and reaches a great size in favored spots in British Columbia. The leaves are of great size, often measuring a foot in diameter, which distinguishes this maple very readily from other Canadian species. Unfortunately, it winter kills at Ottawa. Nor do I know where there is a large specimen growing in Canada outside of British Columbia. The leaf in the illustration is a very small one, but gives an idea of its shape.

6. Ash-leaved Maple, Box Elder (*Acer Negundo*, Linn; *Negundo aceroides*, Moench.—"Large tree, 70 feet; leaves pinnate; leaflets 3-5, ovate or oblong lanceolate, coarsely serrate or 3-lobed, mostly glabrous, 3-5 inches long; flowers before the leaves, staminate flowers in pendulous corymbs, pistillate flowers in pendulous racemes."

A separate genus was formerly made of this tree and it was called *Negundo aceroides*, but in recent years it has been included with the maples. The Box Elder is not found in a wild state in the Maritime Provinces and in the Prov



1. *Acer saccharinum*, Wang. 2. *A. nigrum*, Michx. 3. *A. rubrum*, Linn. 4. *A. dasycarpum*, Ehrh. 5. *A. macrophyllum*, Pursh. 6. *A. negundo*, Linn. 7. *A. pennsylvanicum*, Linn. 8. *A. spicatum*, Lam. 9. *A. glabrum*, Torr. 10. *A. circinatum*, Pursh.

ince of Quebec. In Ontario large trees have been found in the valley of the Humber, near Toronto, and near Chatham, which were thought not to have been introduced; but apart from these two localities, it is not found wild to the writer's knowledge else in the province east of the Kaministiqua River, which is west of Lake Superior. It becomes more abundant westward, and is very common in Manitoba and the Northwest Territories. On account of its very rapid growth and ease of culture, this tree is often planted in Ontario for shade and ornamental purposes. It, however, usually proves unsatisfactory, being unshapely and breaking down easily. The fruit also remains on the female trees during winter, making them quite unsightly. In Manitoba and the Northwest Territories, however, this tree has great value. It is a veritable ironclad and withstands the severest winters. It grows to be a handsome and shapely tree on the prairies, and is very useful for shade, for windbreaks, for firewood, and for other purposes. What the Sugar Maple is to Ontario, the Box Elder is to Manitoba and the Northwest Territories. The male and female flowers of this maple are borne on different trees.

7. Striped Maple (*Acer pennsylvanicum*, Linn)—"Tree rarely 40 feet; bark greenish, striped with white lines; leaves slightly cordate, roundish obovate, 3-lobed at the apex, 6-8 inches long, finely serrate, ferrugineously pubescent beneath when young; racemes glabrous, drooping."

The Striped Maple is common in Nova Scotia, New Brunswick, Quebec, and in Ontario as far as Lake Superior. It is a very handsome little upright tree, with large attractive foliage and curiously striped bark, the stripes being well defined and very noticeable. The flowers, which are yellowish green,



Flowers of Sugar Maple.
Acer Saccharinum, Wang.

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are borne in pendulous racemes and add to the attractiveness of the tree. This maple delights in cool, shady woods, and does not thrive in the open as well as most of the species. The leaves are not highly colored in autumn, but become a pleasing yellow.

8. Mountain Maple (*Acer spicatum*, Lam).—"Shrub or small tree, rarely 30 feet; leaves 3 or slightly 5-lobed, coarsely serrate, pubescent beneath, 2½ to 4½ inches long; racemes rather dense, long, upright; fruit with diverging wings, bright red in summer."

This is a very common maple in damp or wet woods from Nova Scotia to the northern part of Manitoba and as far north as York Factory along the Hudson Bay. In the east it is little more than a shrub, but in northern Manitoba it becomes a small tree. As this species grows more in the open woods than the Striped Maple it usually succeeds better in cultivation. It has its own good points and is well worthy of a place in the ornamental grounds. It blooms during the month of June, and the flowers are followed by bright red fruit which makes the tree quite attractive; the leaves, also, are more or less highly colored in autumn.

9. Smooth Maple (*Acer glabrum*, Torr).—"Shrub or small tree, 25 feet, quite glabrous; petioles bright red; leaves deeply 3-5 lobed or 3-parted, 1-5 inches across, dark green and shining above, pale or glaucous beneath; lobes doubly serrate"

This is a western species and grows wild from Vancouver Island eastward to Banff, in the Rocky Mountains. It has succeeded remarkably well at Ottawa and has proven quite ornamental, the red petioles of the leaves and the red branches contrasting well with the glossy green foliage. The largest specimen at the Experimental Farm is about twelve feet high and twelve or thirteen feet across. It is asserted that there are two species in what was formerly regarded as one, and that the form found along the western coast is quite a distinct species from that growing in the mountains. If this division is made we shall have eleven species in Canada instead of ten.

10. Vine Maple (*Acer circinatum*, Pursh).—"Small tree, rarely 40 feet; petioles and peduncles glabrous; leaves 7-9 lobed, 2-7 inches across, glabrous; lobes acute, doubly serrate; flowers in drooping corymbs with purple sepals."

The beautiful little Vine Maple has quite a limited range in Canada, being confined to Vancouver Island and to the valleys near the coast along the mainland of British Columbia. The leaves of the Vine Maple are paler green than the other species, which gives them a more delicate appearance. They are somewhat similar to the Japanese *Acer palmatum*, and it is possible that the two were originally derived from the same species. The handsome flowers, fruit and leaves, and graceful appearance of this maple, make it very desirable for ornamental purposes where it will succeed. At Ottawa it is only half hardy, though one specimen has now been nearly hardy since 1897.

FICUS ELASTICA.

By Wm. Hunt, O. A. C., Guelph.

The *Ficus elastica*, or Rubber plant, as it is commonly called, is without doubt one of the best and most enduring of decorative plants, either for the greenhouse or the more trying conditions that exist in a window or room of a dwelling house. Although its habit of growth is not as graceful as many well known house plants, such as palms, aspidistra, etc., the thick leathery leaves of this

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Ficus will often retain their bright glossy appearance for a much longer period than most varieties of house plants including those just mentioned, even under more adverse treatment. The propagation of the rubber-plant is, however, the most difficult problem for the amateur plant grower to solve, in connection with its culture. Large plants have frequently to be cut back in order to secure a more shapely plant, or to keep its strong growing branches within reasonable bounds. It is seldom, however, that the growth taken from an ill-shaped plant is successfully propagated. A description of some of the methods usually adopted by florists in the propagation of the Ficus will perhaps be acceptable to readers of the *Horticulturist* who may perhaps have a plant that may require cutting back so as to make it more shapely and symmetrical looking. The pruning or cutting back does not injure the plant unless cut back too severely, as it soon breaks into new growth again if not cut back too far into old wood. Even in the latter case it is only a question of time before it starts into growth again.



Ficus Cutting, Showing Incision.

Mossing Cuttings. — This method of mossing partially severed cuttings of the Ficus, is probably the best and surest method of propagation for the amateur to attempt. For the operation of mossing, a fairly strong and healthy branch or shoot should be selected. One or two of the leaves should first be cut away at the place selected for the base of the cutting. The selection of the part of the branch that is to form the base of the cutting is an important point toward being successful in the cutting taking root, as the wood must not be too old and hard, or too soft and pulpy. Usually, the wood is in a suitable condition about ten or twelve inches from the terminal point of the shoot or branch. After the removal of the leaves, as before mentioned, an incision should be made on the underneath side with a sharp knife, as shown in the accompanying cut. The incision should be made in a slanting direction, running from the base of the cutting toward the tip, and from a half to three-quarters of an inch in length, and should extend about two-thirds through the branch, leaving the remaining one-third of the branch uncut. The incision should terminate close under a leaf joint if possible. After the incision has been made a small thin piece of chip, about one-sixteenth of an inch thick, should be inserted at the termination of the cut. This is done to keep the incision open, so as to allow the thick sap to flow clear away from the incision, as otherwise it would congeal and prevent the cutting from callusing and rooting. The chip should be long enough to extend just through the cutting.

A small stick, or piece of wire should be tied along side of the cutting for a few inches above and below the incision, to keep the cutting in its proper position. Sufficient wet moss should then be wrapped around the cutting so as to cover the incision fully an inch thick after it has been bound tightly around The wrapping of moss should extend about three inches above and below the

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incision, tapering gradually to each end, as shown in the cut. The moss should be bound tightly around the cutting with raffia or fine twine. Sphagnum moss is the best if it can be obtained, if not, ordinary green moss can be used. The bandage of moss should never be allowed to become dry, but should be kept quite moist by syringing or sprinkling with water once or twice every day. In about five or six weeks after the mossing process the cutting should be examined, when, if rooted, it can be severed entirely from the plant, as shown in engraving and potted. If not rooted the moss should be again put around the cutting as before described, and left for a week or two longer. If on examination the base of the cutting shows signs of decay instead of rooting, it should be severed entirely from the plant. In this case the cutting could then be shortened a joint or two at the base, and placed in a four-inch pot filled with sharp sand. Place the pot in a shaded warm part of the green-house or window and keep the sand moist. A plant may possibly be obtained in this way.

The best time of the year for striking cuttings of the Ficus, whether by ordinary or moss cuttings, is during July and August. A warm, sheltered, and fairly well shaded position in the greenhouse or conservatory, is the best place for the plant to ensure success with this method of mossing cuttings. A greenhouse, however, is not absolutely necessary to be successful, as I have rooted cuttings by this method out of doors during the hot months of summer by standing the plants in a warm, well sheltered position.



Rooted Ficus Cutting.



Mossed Ficus Cutting.

In potting the cutting most of the moss should be first removed and the plant securely staked. The leaves should also be tied together fairly tight, so as to prevent the cutting from shifting about in the pot. Use light sandy soil for the first potting, and not too rich. Water the cutting rather sparingly until it has become well rooted in the pot, and keep it in a warm shaded place for a time. I have attempted to describe as clearly as possible the method of rooting cuttings by mossing them. Some allowance, however, must be made as to depth

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and length of incision, length of cutting, etc, as these must of necessity vary a little according to the growth of the branch made use of.

Single Joint Cuttings: These cuttings consist of a single joint with leaf attached. The best part of the branch to secure these cuttings from, is from a few joints above and below the part of the branch described as suitable for cuttings for mossing. Insert the cutting firmly in sharp sand, so that the base of the leaf and stem at the joint is just under the surface of the sand. A shallow box about two inches deep, well drained and filled with sand, will perhaps be better than pots for these cuttings, as they are less liable to be shifted about in the sand. These pots or boxes—as the case may be—of cuttings can be placed in a warm shaded part of the greenhouse, or in a frame that should be covered closely with a sash thickly shaded, so as to exclude the direct rays of the sun. Careful watering, so as to keep the sand always fairly moist is necessary to be successful with these cuttings. I have known cuttings of this kind to strike root successfully when the pots have been placed in a window. Single joint cuttings, however, must be taken in the hot weather if they are to be rooted successfully. The after treatment of the single joint cutting will be the same as recommended for the mossed cuttings.



Ficus Cutting with "Heel."

Terminal Cuttings: These cuttings and the method of taking them differs very little —except so far as the strong growth of the Ficus necessitates—from a gernanium or almost any ordinary cutting or slip. The cutting may possibly be a little shorter than that recommended for mossing, especially if the growth of the cutting is short and close jointed. The leaves of these should be tied up fairly close together and inserted in sand, one in a three or four inch pot and the cutting securely staked. The staking is a very necessary part of the operation, as the weight of the leaves may cause the cutting to move or shift about in the sand and thus prevent its rooting. The same position, etc., will suit these as recommended for single joint cuttings. Oftentimes short cuttings can be taken from the large branches of an old plant with what is known as a "heel" attached. This "heel" is simply a small piece of the stem, from which the cutting is growing, taken off, with the cutting as shown in the cut. If these kind of cuttings can be obtained they will, as a rule, root more readily than the terminal or plain cuttings before mentioned. Terminal cuttings should be cut off near to and close below a leaf joint, as they strike more readily than if severed mid-way between the leaf joints.

I have recently had several letters from subscribers to the *Horticulturist*, asking for information respecting the propagation of the *Ficus elastica*, hence my reason for writing such a lengthy paper on this subject. I may, however, say in conclusion that the method of mossing cuttings as described for the Ficus, can be successfully applied to other plants, more especially to the tall and overgrown stems of Dracenas and Cordylines, that have a natural habit of becoming tall and unsightly looking as decorative plants.

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SEASONABLE NOTES.

By Wm. Hunt, O.A.C., Guelph.

FEBRUARY.

The Greenhouse.

The propagation of bedding out plants will be one of the main features of February work in the greenhouse. Coleus, ageratum, alternanthera, heliotrope and cuttings from similar plants will root readily now in sand. Shade them from the hot sun for a few hours at mid-day.

Carnation cuttings root best in sand in shallow boxes, two inches deep. Place the boxes near the glass in a cool part of the greenhouse; 50° at night and 60° in the day time suits carnation cuttings splendidly. Keep the sand moist but not soddened with water.

All ferns should be re-potted at once, if not already done. January is the best time to re-pot ferns, before the young fronds have made much headway.

Cyclamens and Freesias, that have done flowering, should still have sufficient water to keep the soil fairly well moistened. Pick the decayed flowers, and seed pods (if any) from these plants; it will help to strengthen and mature the bulbs for next season.

Annuals: It is a little early for sowing annuals, even for early flowering, but a few pots of petunia and verbena seed can be sown toward the end of the month. Lobelia seed should be sown at once so as to secure good sized plants for hanging baskets, window boxes, etc. Cuttings of all trailing plants for hanging baskets., etc., should be started without delay.

Azaleas that are out of flower should be syringed every day to promote new growth, and keep down red spider. Fuchsias should be syringed daily.

Use more copious supplies of water for syringing purposes, as the heat of the sun increases. Syringe early in the day, and on warm sunny days if possible. Use plenty of water on the floors. Evaporation of moisture is good for the plants, and keeps down insect pests.

Easter is early this year. Easter lilies, to be on time, will require to be brought into a warm part of the house.

Holland bulbs for Easter flowering should be in the greenhouse now. Better be a week too early than a week too late. The flowering period of plants can be retarded, or the flowers retained, much better as a rule, than they can be forced into flower. Undue forcing is dangerous, even by experienced plant growers.

Give a little air on hot sunny days, 70° to 75° in day time and 55° to 60° at night is a good temperature at this season of the year. Close ventilators early in the day.

The Window.

Plants in the window will begin to feel the increased heat of the sun. The latter will necessitate a close watch being kept for insect pests. The best way to avoid trouble with the insect pests is to try and prevent them from making their appearance at all. Keeping all growing plants such as fuchsias, cyperus, geraniums, calla lilies, etc., fairly well moistened at the roots, and syringing or sprinkling the foliage of the plants two or three times a week with luke-warm water, are about the safest preventives of the appearance of insect pests. A little weak tobacco water in the water the plants are syringed with, applied once a week, will prevent the attacks of some of these enemies of plant life. No plant can flourish when attacked by insects, and it is very hard to get rid of them when once they have gained headway.

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Chrysanthemum plants, that are wanted to be kept for cuttings, should be kept in a rather cool temperature, about 50° suits them. They require less water now than when in flower.

Seed sowing: There are few seeds that can be sown to advantage just yet, except perhaps those recommended for the greenhouse, such as petunias and verbenas, both of which require quite a length of time before good sized plants will be produced.

Cold dips: Watch out for sudden cold dips. February and March are treacherous months in this respect. The hot sun in the day time often lures the plant lover into a feeling of false security and induces neglect in taking proper precautions against the extreme cold often experienced at night at this season of the year. If by any chance your plants should be frozen, place them at once in a warm corner of the room where the temperature is a few degrees above freezing. Cover the plants up carefully and keep them in the dark for twenty-four hours until the frost is out of them. You may perhaps in this way save them, if not frozen too badly. I consider this treatment preferable to deluging the plants with cold water, as is sometimes recommended. Even if the latter course is taken with the plants, keeping them dark for a day or so will help them materially. Avoid bringing plants that have been frozen into a high temperature, and keep them away from bright sunlight for a week or two after they have been frozen. They will also need less water for a time, until root action and growth have well commenced.



Abutilon Savitzi.



Chinese Primula.

MARCH.

The Greenhouse.

Toward the end of the month, or at least early in the month of April, it will be necessary to give partial shading to palms and ferns as well as to newly potted cuttings or young seedling plants. If the shading is delayed too late in the season many of the plants (especially the young growth of palms) will suffer from sun scald. There is even greater danger in this respect at this early season than later on, when ventilation can be given more freely than now during the treacherous weather often experienced in March. Bright hot sun, accompanied

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with keen, biting, frosty winds, makes it difficult to give ventilation sufficient to keep down the temperature without exposing the plants to danger. A light shading will prevent the hot sun from doing any great damage on bright, cold days, when perhaps it is difficult to open the ventilators. Plants in flower will scarcely need shade for a week or two yet.

Water must be used more freely than hitherto, not only to the roots of plants, but on the floors as well as overhead syringing. Sprinkling the floors liberally with water, early in the afternoon, will benefit the plants very much.

Freesias. Pots of these useful greenhouse plants should be given an ample supply of water, after they have done flowering, if good strong flowering pips or bulbs are required for use next season. Freesias commence to form young bulbs just about the time the plants are in full flower, so that it is necessary to give them water several weeks after they are out of flower. The drying off or resting period must not be commenced until the young bulbs have attained to almost mature growth, which is usually three or four weeks from the time the old bulbs are out of flower. After this period water can be withheld gradually until they are dried off completely, when no more water must be given them until time to re-pot them in August or September.

Roses. These, whether in pots or planted out, will require regular daily syringing on bright days. A little fertilizer will be found beneficial now that a more active growth has commenced.

Cyclamen. Continue to water cyclamen rather liberally, even when they have done flowering. In fact at no time should the soil become quite dry, even during the summer resting period. Pick off all the seed pods unless seed from them is required, as the production of seed reduces the strength and vitality of the corms or bulbs considerably.

Fuchsias. These should be coming into flower nicely now. A little shade, plenty of water at the roots and a gentle syringing every day will help fuchsias greatly. A little fertilizer once a week will also help them along.

Azaleas. Syringe azalea every day when they are out of flower. Water at the roots must be given in sufficient quantities to thoroughly moisten all the roots.

Primulas. Less water should be given these plants when out of flower. The double variety (Primula alba plena), as shown in the engraving, should be propagated as soon as they are out of flower. Cuttings of this useful variety strike readily in sand in a shady position. This double variety of the Chinese Primulas is one of the best and most satisfactory for an amateur grower. Like all other primulas it delights in a well drained soil, with a good admixture of leaf soil added to rich loamy potting soil, as well as a little sand mixed in.

Annuals. Seeds of these for early flowering can be sown now. Better results will, however, probably be obtained by sowing them a month later.

Bedding Stock. Cuttings of coleus, ageratum, lobelia and all bedding out plants should be taken now. Heliotrope and abutilons strike readily now from tender growth. One of the most valuable additions to the list of bedding plants recently is the pretty dwarf growing Abutilon Savitzi. Its bright silvery marked leaves and its compact habit of growth promises to bring this new variety into great popularity as a bedding plant.

Flower Garden.

March is a trying month for half-hardy plant life out of doors. A light covering of some protective material such as straw, long manure, etc., will be found beneficial to many plants laid bare by their winter blanket of snow having been melted away from them. A little protection now for a few weeks will be more needed than earlier, even though the frost may not be quite as severe.

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Bulbs. These should not be uncovered until danger of severe frost is over. Remove the covering by degrees, as sudden exposure to light and air (and perhaps late frosts) will likely injure the flowering heads.

The Window.

Late in March, or early in April, is a good time to re-pot all the hardiest kind of window plants, such as geraniums, cyperus, ferns and plants required for summer decoration.

Tuberous Begonias. Old tubers of these plants can be started into growth now. Shake out the old soil carefully from the tuber if it has been kept in the pot during the winter. Good, rich, loamy potting soil with a small quantity of soil mixed with it suits these pretty summer flowering plants splendidly. Soil that a geranium will grow well in will suit tuberous begonias. Use plenty of drainage in the pots; water the soil once throughly after potting. Water should then be given sparingly until the plants have well started into growth.

Summer Flowering and Foliage Begonias, including Rex varieties, can be potted. The same remarks regarding drainage and watering will apply as for tuberous begonias, but the soil, especially for the Rex varieties, should have about one-fourth part of leaf soil added to that recommended for the tuberous variety. Amongst the newer varieties of begonia suitable for the window are B. Thurston, B. Haageana and B. nivea, whilst older varieties such as B. Sandersonii, B. fuchsiaoides, and of course Begonia rubra cannot be omitted.

Annuals. Seeds of those can now be sown so as to secure early flowers. Although the antirrhinum is not classed strictly as an annual, it can be grown as easily and successfully as any of the annuals. The newly introduced dwarf flowering varieties make a splendid display as border plants and will give a supply of flowers during the burning days of July and August, when flowers are often scarce. These dwarf growing varieties also succeed splendidly in pots in winter. The beds of these plants at the recent Pan-American exhibition were very much admired and proved conclusively the suitability of the new types of these old favorites for bedding plants. These are very easy to raise and a few plants should be found in every flower garden.

The Scabiosa is another annual that will give good results during the hot months of summer and on until late in autumn. A pot or two of these sown early in April and planted out the second or third week in May will, with very little care and attention, provide a bountiful supply of flowers for decorative purposes A bunch of the multi-colored types of scabiosa with a few spikes of antirrhinums. and mignonette sticking up above the somewhat flat flowers of the scabiosa, relieved here and there with a few sprays of fern or foliage, will make amost acceptable vase of flowers for table or house decorative purposes. The scabiosa, like the snap-dragons, are not very exacting as to the nature of the soil, flourishing in either a loamy or a stiffer soil with almost equal vigor and profuseness of flower. A rich soil, however, brings much larger flowers and richer and more intense shades of color. A dozen or two plants, each of the snap-dragon and scabiosa, planted out in the garden will not only beautify the flower garden but furnish an almost unlimited supply of cut flowers the entire summer. Both of these varieties are largely grown by commercial florists, a fact that proves their usefulness for cut flower purposes.

APRIL.

The unusually fine weather experienced here in this section of Ontario during the early part of March, makes it somewhat difficult at this date—March 12th—to outline very closely what operations may be necessary or adaptable for

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the month of April amongst the plants and flowers. With the mercury registering about 52° at midnight 70° in the shade at mid-day, and the pleasant warbling of robins and greybirds greeting one on every side, to say nothing of reports of sowings of sweet peas, etc., having already been made in the open ground, it is difficult to realize that we are three weeks and more from the beginning of April, or yet clear of winter weather. It is spring seasons such as this that tempt those who have tender or half hardy plants to expose them somewhat too abruptly from their warm winter quarters to the uncertain weather conditions that often these seductive spells of summer in early spring. The transfer of plants from their winter quarters to out door life always requires the exercise of care and discretion, much more in seasons such as the present one when spring promises to be unusually early.

A word or two of timely warning may prevent the loss of some favorite plants. I am aware from my own past experience that reminders of this kind are necessary at this season of the year, when we are perhaps too eager in anticipating the delights of summer in the garden, by undue haste in exposing tender or half hardy plants to uncertain weather conditions outside.



Canna, Mad. Crozy.

The Greenhouse.

Bedding plants. The latest struck cuttings of these should now be potted off, so as to become established in the pots prior to being hardened off outside later on.

As a rule carnations, geraniums, mignonette, early sown asters and other comparatively hardy plants can be transferred to a cold frame outside. A sash as well as other protective material should, however, be in readiness to cover them up with in cold weather. Coleus, heliotrope, lobelia and the more tender varieties are safest in the greenhouse until the danger of frost is past. It is always wise to shade plants for a few hours in the hottest part of the day for perhaps a week until the growth has become hardened to the more exposed position that a sash and frame gives, especially if the plants have been kept in a very close greenhouse. The little dwarf growing bedding plants known as *alternanthera* are often very difficult to secure cuttings from for propagation purposes. A good warm (not rank) hot bed is the best place to put stock plants of alternanthera in to secure rapid growth. Plunge the pots or boxes into earth or ashes up to the rim and keep them close except on sunny days. Young plants as well as stock plants can be made to move rapidly by this treatment. Heliotrope, coleus and achyranthes can be treated in the same way, but these last mentioned require more air than the alternantheras do, on bright days, and perhaps a little shade on very hot days.

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Cannas. Roots of these plants should be brought from underneath the benches or from the warm cellars where they have been wintered in. If the clumps are large it will be best to divide them up into clumps having from two to four good strong eyes. This can be done by simply breaking away the one section from the other with the hands. The use of the knife in this operation should be avoided if possible. Pot the small clumps into fairly light soil and water thoroughly once. Very little water will be required afterwards until the plants have become well established. Cannas treated in this way can be brought on early, and give immediate results when planted out. The pots of these can be stood down on the walks to start them, if the situation is not too dark, and care is taken that they do not get too much water. The possibilities of the canna as a summer decorative plant are only commencing to be realized. The recent introductions of dwarfer growing, large flowering plants will assist greatly in advancing their present popularity. It is quite possible, taking the coleus as an example in this respect, that we may see as great an advancement in cannas in regard to decorative foliage during the next decade as there has been with coleus, when compared with the first introductions of the "East Indian Nettle," as coleus were at first commonly termed. Imagine a canna of dwarfer habit than the Charles Henderson (three feet), a spike of flowers equal to the flowers of the Burbank Canna, and foliage that will vie with the beautiful markings and rich coloring of a *pandanus veitchii*, or of a spotted diffenbachia, or with the deep rich shadings of a maranta; and you will have an imaginary glimpse of what I predict will be a near approach to the ideal canna of the future. But this is prediction and not seasonable notes on the culture of the canna.



Annual Larkspur.

The foliage of the canna, especially when young, is very tender, and on that account requires care on first taking the plants out of doors. Late in May or early in June is about the best time to expose them outside.

Shading. Plants will require careful shading and an increased supply of water as the heat of the sun increases. Water and syringe the plants early in the day. Close ventilators early in the afternoon. Give increased ventilation as required.

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The Herbaceous Border. About the end of April or early in May is the best time to attend to herbaceous plants in the flower garden. Any dividing or transplanting of the early flowering perennials should be done as early as possible. The pretty little pink and white flowering *phlox subulata*, or moss phlox, as it is sometimes called, should be divided and transplanted very early. A better time to do this, however, is early in September, so unless the growth has got very straggling this can be left over until early fall.

Both the herbaceous and tree pæonies should be transplanted early if done at all. Dielytras and clumps of German Iris should be divided early. All of the plants just mentioned will, however, grow and thrive and produce their flowers in abundance for three or four years without being divided. After that period transplanting is beneficial, as larger flowers, higher colored and more luxuriant foliage can be obtained than by leaving them in dense matted clumps for too long a time.

Herbaceous spireas (*Spiræa aruncus* and *S. filipendula fl. plena*) can also be transplanted early. About the first week in May will be early enough for most of the later flowering perennials. A good general rule to work on at this season of the year in regard to transplanting perennials is to divide and transplant them when the young growth is about an inch high. Exact dates for a week or so cannot be given as the best time for these operations, as situations and seasons vary so much, but about the end of April and early in May is about the right time in this section of Ontario.

Best Twelve Herbaceous Plants. I am often asked what I consider are the best twelve varieties of herbaceous perennials. The following twelve species, many of which can be had in several varieties, will be found to be hardy, easy of culture, and will come into flower in succession from early spring until late autumn This latter feature, viz., successive flowering period, I consider one of the main points to be thought of when planting a border, or even a few plants of herbaceous perennials. Hardiness, and an adaptability to grow readily in almost any soil, is another point that has been taken into consideration in making up this selection, as well as their suitability for cut flower purposes. They are given here in about the order that they will come into flower. I have also given the average height of the plants, a point lost sight of sometimes and one that causes dissatisfaction oftentimes later on.

1. *Iberis sempervirens*, 6 inches.
2. *Dielytra spectabilis*, 2 feet.
3. *Iris Germanica*, 18 inches (in variety).
4. *Herbaceous Paeony*, 2 feet (in variety.)
5. *Gaillardia grandiflora*, 18 inches.
6. *Campanula persicefolia alba.*
7. *Aquilegia*, 2 feet (in variety).
8. *Hemerocallis flava*, 2 feet.
9. *Phlox paniculata*, 2 to 3 feet (in variety.)
10. *Pyrethrum hybrida*, 18 inches.
11. *Achillea*, The Pearl, 2 feet.
12. *Rudbeckia lanceolata*, 5 feet.

This will be found to be a good list of twelve iron clad border plants, many of which can be had in great variety, especially the iris, paeony, aquilegia and phlox. I would very much like to have added the delphinium, coreopsis, and one of the thalictrums and the beautiful little gypsophilla paniculata so useful for cut flowers, but I could not see my way clear to omit any of the foregoing list. The thalictrums are most useful for cutting for bouquet green, but succeed best in a shaded position, such as on the north side of a fence or building.

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Hardy Roses. These should be pruned as early as possible, if not already done. Prune closely, leaving from 4 to 6 inches of last year's growth below where the shoots are pruned off. Any planting of these, or of hardy shrubs or trees, should be done at once. Fork over the rose beds after pruning the bushes. A little fertilizer, such as bone meal, very rotten stable manure, forked in around rose bushes or flowering shrubs will help them materially.

Annuals. These can be sown outside now. A small frame made of boards and placed in a warm position with a few inches of good soil will be a good place to sow most annuals in. They are easier cared for in the early stages of growth treated in this way than if sown in the open border. Mignonette and nasturtium, and perhaps stocks, are best sown in pots or in the place they are to grow in, as they do not transplant very easily.

JULY.

Flower Garden.—Constant surface stirring of the soil in flower beds or borders will not only destroy weed crops, but will also materially help the growth of all kinds of bedding plants. Deep stirring of the soil is not necessary, if the ground was properly prepared before planting. A very small three or four-toothed rake, or a light scuffle hoe, are the best tools for this work, which should be done when the soil is fairly dry, and before it has had time to crust over very hard on the surface.

Staking and Tying. These operations are often left until the plants are badly damaged by wind or rain storms, or perhaps entirely ruined by not being attended to earlier. It is always a good plan to have stakes for such plants as dahlias, ricinus, etc., driven in near the plants requiring support. Many a fine plant has come to grief because a stake could not be found handily just when the plant needed tying. In the matter of tying up plants always endeavor to stake and tie plants so that they are as natural looking as possible after the operation is performed. Avoid the close bunching process of tying that makes the plants look more like bundles of stems and foliage, than growing plants. Another point deserving attention when tying plants is to endeavor to place the stakes in such a position that they will be hidden from view as much a possible by the foliage. Use soft twine for tying purposes, so as to prevent as much as possible damage from friction, and use neat sizeable stakes.

Decayed Flowers. These should be kept picked off regularly, unless required to remain on the plants to help produce seed. Decayed blossoms are not only unsightly, but also exhaust uselessly the vitality of the plant. In this respect do not forget that daily picking of sweet-pea blossoms, and not allowing them to go to seed, not only improves the size and depth of color of later blossoms, but also helps materially to extend the flowering period of the plants.

The Greenhouse. If ferns and exotic plants occupy the greenhouse during the summer months, the glass must be heavily shaded. These plants will require plenty of water at the roots and a moist atmosphere maintained by daily syringing, as well as heavy sprinklings of water on the floor when the ventilators are closed. Where choice ferns and exotic plants are growing the ventilators should be closed an hour or two before the sun ceases to shine on the greenhouse.

Roses and Chrysanthemums. If roses and chrysanthemums occupy the greenhouse, much more ventilation is necessary, and far less shading required than for ferns, etc. In fact the shading for both roses and chrysanthemums should be very light, as close shading induces a weak spindled growth that is not conducive to good flowering results. Roses and chrysanthemums should have liberal supplies of water at the roots and daily syringing on bright days. Pick every bud off the roses as soon as the bud is formed, so that the whole strength of the plant can be used to produce a good stocky growth of wood.

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Begonia, Weltoniensis Alba.

Freesias. These useful winter flowering bulbs should now be kept quite dry and dormant until they are potted on. They can be left in the soil they were grown in, and the pots stood away in a dry, cool shed, or the bulbs can be picked out from the soil and put in a pot or box, with sufficient dry sand or earth thrown over them to keep them from getting too dry and shrivelled. In either case keep the bulbs quite dry, and in a cool place. A shelf in a shed is a good place for them. August and September are the best months for starting freesias into growth.

The Window Garden.

Window-boxes form the most prominent feature for window decoration during the summer months. It is oftentimes a difficult matter to secure flowering plants that are suited for shaded positions on the north side of the house. Foliage plants and ferns can be easily selected for these positions; flowering plants in variety are not so easily obtained. Many varieties of summer flowering begonias can be had however that will give splendid results in windows or on verandahs where the sun shines for perhaps only an hour or two, morning and evening. Amongst the most effective and easily grown kinds is the pink flowering Weltoniensis begonia, also the white flowering variety Weltoniensis alba (See cut), the former being the more robust and easier to grow of the two kinds. Being of a semi-tuberous nature both of them can be kept partially dormant during the winter, but must not be dried off completely in the same way that the tuberous varieties are.



Begonia, Bruant.

Another good variety for summer flowering is the dwarf growing, white flowering begonia Bruant (See cut). This pretty little begonia can be easily kept during the winter, its bright, glossy, green foliage being most acceptable even when not brightened up with its ivory white blossoms. It must not be given as much water, however, during the winter as when it is in active growth in the summer time. The Begonias mentioned as bedding varieties in last month's journal are also good varieties for culture in windows, either as pot plants or in window boxes. These Begonias will be found to be

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be quite an acquisition to the comparatively limited list of flowering plants suited for window boxes in shaded positions.



Geranium before being cut back.

Geraniums for winter. This is a good time to commence preparing a stock of these ever popular and useful plants for winter flowering in the window.

It is quite possible that many readers of this journal have a favorite geranium plant that has become gaunt and unshapely in growth similiar to the one shown in the accompanying illustration. Instead of planting it out in the border, as is often done to try and make a shapely plant of it before autumn, it would be far better to treat it as shown in the engraving by giving it a severe cutting back. If the growth of the plant is very soft and sappy the cutting back process should be deferred until the plant has been stood outside in the pot in a sunny position for the wood to harden a little. It can then be pruned back as shown in the cut, by pruning the growth back to within a few joints of the hard growth of the stem. After the pruning back, the plant should be put in a partially shaded position near a building or fence. Very little water should be given until it shows signs of growth but the soil should never become really dust dry. As soon as growth commences, shake the plant out of the earth and re-pot it into a size smaller pot in rather sandy soil. Plunge the pot up to the rim in sand or coal ashes, and water well once, after that water only when the soil shows signs of dryness. In about five or six weeks the plant will require a larger pot, probably two sizes larger than what it was potted back into before. When it has become established in this size pot it will probably be time to take it into the window where it should give good flowering results. Old geranium plants give good results if treated in this way; much better oftentimes than young plants taken from cuttings. The cuttings, however, taken from the plant when cut back should be placed in



Geranium after being cut back.

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sand, either in a pot or shallow box. These will also make nice little plants by autumn for the window. The tips of the shoots should be taken for the cuttings, five or six inches being a good length for the cutting. By treating overgrown, gaunt specimens of geraniums in the way I have attempted to describe, many plants that gave good flowering results last winter can be had in better shape and condition than during last season. It is useless and unnatural to expect even the all-enduring geranium to flower and grow the whole year round. This pruning back and partial resting process, as described, gives a good shapely plant as well as allowing it a partial rest which all plants require in greater or less degree to be successful.



Calla Lily.

AUGUST.

Freesias. A few of these pretty little Cape bulbs should be started now for early winter flowering. Reserve some bulbs for later potting, so as to have a succession of their sweet-scented flowers from December to April. Plant five or six bulbs in a 4 or 5-in. pot. Very rich soil is not necessary; soil that geraniums will grow well in will suit freesias. Cover the tips of the bulbs so that they are almost a quarter of an inch under the surface of the soil. The top of the soil should be about half an inch from the rim of the pot to allow room for watering. Stand the pots outside where it is not too sunny, never allow them to dry out, and do not keep the soil soaked with water all the time. Let the pots stand outside until early in September, then remove them to the window or greenhouse. Place them in a cool part of the house, as the freesia dislikes forcing. Larger blooms, and more of them, are the results of letting freesias take their time in growing.

Calla Lilies. These should now be re-potted if they require it. Do not overpot them. Too large a pot often means lots of leaves, but no lilies. Sometimes a top dressing is better than re-potting. This is done by taking about an inch or so of the old top soil, and putting some good rich soil in its place. Keep the calla lilies outside in partial shade until there is danger of early frosts. Water well when once established in the pots.

Pelargoniums. These are often known as "Lady Washington" geraniums. August is a good time to cut the old plants well back. Cut the growth of the past season back to within an inch or so of its base. Water the plants very sparingly until the stems show signs of growth. When the young buds or growth is scarcely one-eighth of an inch long, the plants should be shaken out of the soil they are in. If too heavily rooted, which is not often the case, cut off the tips of the roots and re-pot the plants into a size smaller pot. Use two parts of good loamy potting soil, and one part of sharp, fine sand well mixed together. Water the plants once thoroughly, then withhold water until the soil shows signs of dryness. Place the pots outside in a shady position on some coal ashes or

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boards, the latter are to keep worms out of the pots. A shaded sash and frame is a good place for pelargoniums after re-potting, until they are taken in-doors. Re-pot the plants into pots one or two sizes larger in December. Use richer soil and less sand for potting them in at this time. The tips of the growth taken from the pelargoniums now will strike readily in sand in pots. The cuttings of these should have about five or six joints, unless the growth is hard, when shorter cuttings may be used.

Geraniums and Coleus. Cuttings of these should be taken now so as to get the plants established before winter sets in. Five or six cuttings put in sand in a 4-in. pot, and the pot plunged in the ground out side where the hot sun does not strike it, will suit geranium cuttings very well. Keep the sand moist, but not soddened with water.



Hibiscus incanus.

Pansies. If these are wanted for early spring flowering the seed should be sown now. Sow in a shallow box in fairly light soil. Place the box in a shaded place out of doors. When the plants are large enough to handle, plant them out in light, rich well drained soil in a shaded frame facing the south. A sash should be placed over them in very severe weather in winter, or the plants should have a light protection of brush and leaves from December to March, instead of the sash.

Petunias and Verbenas. If you have a choice variety of these you wish to take up to save over winter, cut the plants well back now. As soon as young growth commences, take them up carefully when the soil is moist, and pot them into some good potting soil. Place the pots in the shade or in a frame with a shaded sash if you can. Water sparingly for a time after the first watering.

SEPTEMBER.

Tender Plants.

All tender greenhouse and window plants that are required for winter decorative purposes or for beautifying the garden next season will have to be closely watched if they are still out of doors, so as to prevent unpleasant and damaging surprises by early frost. Stock plants or cuttings of coleus, heliotrope, achyranthes, salvias, and ageratum should be at once secured, if not already attended to, as these plants are susceptible to cold, chilly weather and are easily damaged by the slightest frost. Petunias, verbenas and geraniums, being of a hardier nature, may perhaps be safe until about the end of the month, but it is always well to be on the safe side and secure a stock of cuttings or plants before they are damaged by frost. Plant growth that has been frozen only very slightly is often difficult to propagate, even if the growth does not appear to have been damaged. Begonias, cactus, calla lilies, agaves and all plants of a

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similar tender nature should be taken indoors when chilly, cold weather prevails. Palms, cordylines, oleanders, hydrangeas and even aspidistras may perhaps be left outside until towards the end of the month, at least in the day time. Fresh air and a fair amount of sunshine out of doors is much better for plants than the close, dry atmosphere of a dwelling house, or the super-heated temperature of a greenhouse at this season of the year, as long as the plants are safe from frost. The temporary protection of a sash and frame, or even the protection afforded by a verandah, or some slight covering placed over plants for a few nights, will often extend their period of outdoor life for several weeks at this season of the year, as it is seldom that early frosts prolong their visits beyond one or two nights.

Chrysanthemums. Although these plants are almost hardy, they must not be exposed to frost, or even to continued cold, wet weather, if good flowering results are to be obtained. Where only one or two are grown in pots for the window they can be lifted under cover for the night and set out of doors again in the morning. If the plants are put into the greenhouse, or even into frames, they must be given plenty of air and water, especially on warm, sunny days. Syringing, or sprinkling the foliage early in the day on hot days, will also benefit them materially. Disbudding will also soon have to be attended to with chrysanthemums. This is done by picking off with the thumb and finger all the lower buds as soon as they are about the size of small peas, leaving only one, or perhaps two of the top or terminal buds at the top of each branch or stem. By taking off these lateral buds, fewer but very much larger flowers are obtained than if all the buds were left to mature. As soon as the buds are formed on the plants liquid manure should be given them about once a week until the flowers are fully developed. Tobacco water, or fumigating with tobacco, are the most effectual remedies for the attacks of black or green fly on chrysanthemums. The black fly is oftentimes very persistent in its attacks, and close watch will have to be kept to prevent its appearance. As tobacco stems or the raw leaf of tobacco is sometimes difficult to obtain, a good substitute can be found by using a cheap cigar for making tobacco water or for fumigating plants with. By pouring about a quart of boiling water on a cigar after it has been unrolled sufficient tobacco water can be obtained to sprinkle a number of plants with. The solution must be allowed to cool before using. If any of the tobacco water is left over it can be kept a long time in a bottle tightly corked. Start with the tobacco solution before the plants are badly infested, as, if the aphis or fly once gets into the flowers, they cannot be eradicated without injuring the blossoms.

Roman Hyacinths. If the beautiful white sweet scented spikes of these early flowering hyacinths are wanted for Christmas time the bulbs should be secured and potted as early as it is possible to get them. By planting two or three bulbs in a four or five inch pot early in September and plunging the pot outside in ashes or sand—or even sandy soil—until the bulbs have made good root, which will be in three or four weeks, and then placing the pot in the window or greenhouse, these useful winter flowering bulbs can be had in flower even before Christmas if required. Plant the bulbs about half an inch under the surface of the soil so that the tops of the bulbs are well covered, water them well once and then plunge or bury the pot in an upright position until the bulbs are well rooted and you will be rewarded by a nice pot of sweet-scented flowers for your trouble. The soil in the pot should never be allowed to get quite dry whilst the plant is growing and when in flower. The pink and blue varieties of the Roman Hyacinths are very pretty, but not as early or as easily grown. By potting a few of these bulbs every two or three weeks until November, or even later, a succession of their beautiful blooms may be had until quite late in the spring. These later planted bulbs must, however, be covered with ashes or soil

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in a cool cellar or shed, or in a box or frame out of doors where they can be covered and protected from severe frosts whilst making roots as before mentioned.

Cannas. As soon as the first frosts have touched the foliage of cannas the stocks should be cut off about six or eight inches above the ground. The roots should then be dug up entire with a little earth adhering to them and placed in a dry shed or barn for a week or two where frost cannot reach them. Before severe frosts they should be placed in a fairly dry, warm cellar, or laid under the benches in a greenhouse, where there is very little moisture to drip on them. A temperature of about 40° or 45° suits them very well when dormant in winter.

Dahlias These should be treated much in the same way as recommended for cannas, with the exception that the dahlia roots will keep well in a slightly lower temperature. Packing the roots in dry sand in a cool, dry cellar is probably the best method of wintering dahlia roots. The sand will prevent the tubers from becoming too dry, as this latter condition is almost as dangerous to dahlia roots in winter as an excess of heat and moisture. Dry the dahlia roots fairly well before stowing them away finally for the winter.

NOVEMBER.

Flower Garden.

If the weather is sufficiently open and no hard frosts prevail, this will be found the most suitable time for making new walks, flower beds or borders, as the winter rains and snow will assist greatly in settling the soil down before spring operations commence. Some planting of the hardier varieties of border plants can also be done to advantage. German Iris, Pæonies, Hemerocallis or Lemon lily, Dielytras or Bleeding Heart, as well as Lily of the Valley, are varieties that succeed well if planted late in the autumn. If left until spring, they are often overlooked and forgotten until it is too late for them to take root and give flowering results the same season. It may be advisable, however, to give these late planted varieties a mulching of leaves or long strawy manure later on, before very severe weather sets in. The Iris would probably be better without being covered up or mulched, as mulching is liable to damage and smother the growth. Fibrous rooted varieties of hardy border plants, such as Gaillardias, Phlox paniculata, Coreopsis, Rudbeckias, etc., succeed better transplanted in early spring.

Bulbs.—Most varieties of spring flowering bulbs, such as Tulips, Crocuses, Snowdrops, Scillas, Chionodoxas, as well as the Daffodil Narcissus, require very little, if any, covering during winter, excepting in very cold localities, or when the bulbs were planted very late in the season. A light mulching of long strawy manure four or five inches deep spread over the ground where the bulbs are planted, or three or four inches of leaves with a light covering of long grass or manure, or even pine boughs or brush to keep the leaves in place, make a splendid protection for bulbs in winter.

Roses.—Budded plants of even the hardier varieties of out-door roses are better if given some extra covering during winter. Banking the soil up in a conical form about a foot in height around the plant will afford great protection to out-door roses in winter. A mulching of strawy manure or leaves in addition to this would also be beneficial. In localities where the temperature is often for a long period below zero, some extra protection even to this would be advisable. Long straw, an inch or two in thickness, bound around the tops, would be a benefit where extreme cold prevails, and where, perhaps, the snow fall is light or uncertain. The rush matting used for covering tea chests, wrapped several times around the plant, makes a splendid winter covering for roses or any tender plants, as it, to a great extent, excludes moisture and still allows a circulation of

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air to the plant sufficient to prevent rot and mildew,—the latter often occurring when plants are covered up too closely so as to admit no air at all to the plant.

Roses on their own roots are hardier than budded or grafted plants. Even these would benefit by some protection around about the base of the stem and over the roots, even if the growth was not altogether covered. It is best in all cases, however, to leave the mulching or covering of plants until late in the season, when severe weather is likely to set in, so as to allow the growth of the plant to harden off in a natural way fully exposed to the air.

A very essential point in protecting plants in the manner described is to so arrange the covering, whatever it is, so that it excludes as much moisture from the growth as possible. An old flour or sugar barrel minus the lid, turned bottom up over a tender rose or shrub, is a good protection. Holes should be bored around the sides to admit air, but the top of the barrel, when turned up, should be water tight and intact. Some straw or leaves placed or tied around the plant before it is covered with the barrel would be beneficial.

Window Plants.—The advent of colder weather means increased fire heat, the latter also meaning an increased aridity or dryness of the atmosphere. The latter condition will probably induce a visit from insect pests, unless precautions are taken to prevent their appearance. Green fly and red spider are most to be feared, especially the latter, as their appearance is not as easily detected as that of the aphis or green fly. Copious sprinkling and syringing with cold water is the best preventive for the attacks of the so-called red spider, Salvias, Fuchsias, Roses and Carnations are first favorites with this little pest. When first attacked, the leaves of these plants present a whitish, dusty-looking appearance, especially on the underneath side, and the leaves will soon commence dropping unless the plants are regularly and thoroughly sprinkled or syringed once or twice every day. Tobacco water, as recommended in the September number is the best remedy for green fly, although tobacco leaf or stems, or even a cigar thoroughly dried and rubbed into a fine powder and sprinkled on the plants infested with green fly will generally rid the plant of them. The latter application is best made after the plants have been recently sprinkled or syringed, as the tobacco dust adheres better when the foliage of the plant is moist.

Freesias. Pots of these that are well started should have the full benefit of the sun and sufficient water to keep the soil moist, but not soddened. Freesias do not like liquid manure, and do not require it if the soil they are in is only of a fair average fertility as generally used for pot plants.

Rex Begonias. Plants of these that have, perhaps, been resplendent with their beautifully marked foliage, will generally show rapid signs of decay towards winter. This is quite natural in these plants at this season of the year and is indicative that the plants require a period of partial rest, and it is best to allow them this period of partial rest when the leaves present the appearance mentioned. It is useless to deluge the plants with water at the roots, as is often done when the plants show signs of decay. By withholding water gradually from the roots and barely keeping the soil moist, the fleshy rhizomes and stems, and perhaps some of the leaves, may be kept in fair condition until spring or early summer, when the plants can be re potted, or, if that is not necessary, the plants will show signs of new growth as the warm summer weather approaches without re-potting. Rex Begonias, and in fact all summer flowering and foliage Begonias, require to be kept in a temperature not lower than 45° or 50° when resting in winter. A slightly lower temperature than the plants have been accustomed to, and only sufficient water to barely keep the soil in the pots moist, are the conditions that induce this partial resting period so essential to almost all perennial plant life at some season of the year. Rex Begonias should never have their leaves sprinkled with water in winter, as it tends to spot and rot the foliage.

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Gloxinias, Tuberous Begonias, Fancy Caladiums and Achimenes. All of these should now be resting and the soil left quite dry until time to start them in the spring. I have found that leaving these in the pots undisturbed all the winter is better than taking the bulbs or tubers out of the soil and packing them in sand or charcoal. Where large quantities are grown, it might be necessary to knock them out of the pots to economize space, but where only a few are grown, it is very easy to stand the pots back in a dry place on a shelf, where no drop of water can reach them. A temperature of 55° will suit all but the Tuberous Begonias when dormant; these latter I have found to keep better in a temperature of about 40° to 45°.

Summer Flowers for Florists.

The commendable and increasing demand on the part of the flower-loving public during the last few years, for a greater display of taste in the more natural arrangement of flowers, necessitating their more lavish use in the make-up of designs and floral decorative work in general, makes it imperative on the part of florists, to consider well how they can best supply the wants of their customers in this respect.



Begonia Weltoniensis (Pink Flowering).

The grouping of palms and foliage plants, as well as the very general use of large quantities of fern fronds, asparagus, etc., for room decorative purposes, often requires the use of large quantities of flowering plants and cut flowers, to brighten up the density of these masses of green. Bright colored foliage plants, such as crotons, pandanus veitchii, etc., are admirable for this work, but they are not always available, and cannot be used in many positions, even when they are to be had.

Roses and carnations can of course usually be obtained, but these cannot always be had at prices that will warrant their use except for the finer points of florist's work. Out of door flowers can usually be had in summer, but with the failure or partial failure of the sweet pea and aster crop, even these during the hottest weather in summer are often very limited both in quality and quantity, and many kinds of out-door flowers are too common almost to allow of their being used satisfactorily.

It seems to me that the empty benches so commonly seen in many florists' establishments could be more profitably used than they are, to supply this demand for a better class of flowers than is often obtainable out of doors during the summer months.

Japan lilies, more especially *Lilium speciosum album*, *Lilium rubrum* and *Lilium auratum*, as well as other varieties of this class can be, and are grown in

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large quantities, but these sometimes, like our, at one time, reliable and beautiful Easter lilies, have of recent years become more fickle and uncertain in their character, and are at the best too costly, except for the very best class of work.

Although it is impossible to attempt even to fill the place of the gorgeous beauty of roses and carnations, as grown at the present day by our florists, or the more chaste and delicate beauty of the lily, there are some plants that I have found most useful as accessories and auxiliaries to these indispensable florists' flowers mentioned. I have reference more particularly to begonias.

For many years past I have grown *Begonia Weltoniensis* and *Begonia MacBethii and Begonia Weltoniensis alba* in as large quantities as desired, and although these varieties have been known to most of us for over a quarter of a century, or at least two of them, they cannot, in my opinion, be surpassed by any of our newly introduced varieties, taking ease of culture, handling and keeping qualities, as well as profuseness in flowering habit into consideration. By wintering over a few old plants and starting them in April or May, and propagating as soon as the cuttings are ready, a fine batch of plants can be had early in August, that will furnish a good supply of bloom or pot plants, at a time when flowers and flowering pot plants are scarce. By drying the plants off gradually when they are through flowering, and putting them on a front shelf under the greenhouse benches where the drip does not bother them, or on a back shelf in the greenhouse, or even in a warm potting shed, these begonias will keep splendidly, and occupy no valuable winter space. I have found two-year-old plants profitable, as they can be grown on into 6 inch or 7 inch pots, but after the second season I have not found the keeping qualities of the plants as reliable as younger stock. The *Begonia Weltoniensis* is a splendid bedder, and succeeds well in almost any position in light soil. Fairly light soil should be used for pot plants of this begonia. Other newer varieties, such as *Begonia Vernon, Bruantii, Erfordii, Ingramii* and other summer flowering types of Begonia semperflorens, will not compare favorably, in my opinion, with the two varieties just mentioned, excepting perhaps that these latter can be easier raised from seed than the Weltoniensis begonias. The seed, however, should be sown early in the spring, about February, to secure early flowering plants the same season.

The new hybrid type of Gloire de Lorraine Begonia, although beautiful and floriferous at almost all seasons, can scarcely be considered as a summer begonia. Although several new types and varieties of Begonia semperflorens have recently been introduced, at present there is still room for an ideal summer flowering begonia for florists; a want that may possibly be filled, as begonias are very susceptible to cross-fertilization, a fact that many of our principal florists are taking advantage of, as is shown by the introduction of so many types and varieties of this beautiful and useful class of plants. But the ideal florist's begonia has yet to be raised, and like all other classes of beautiful plants to be found in the floral world, we shall never know when the highest possible point has been reached, so great and mysterious are the workings of nature, when assisted by art, as well as by the assistance of bees and other insects in hybridizing and crossing different varieties of flowers.

I have been pleased to learn during the last few days that the three varities of begonias mentioned, viz.; *Begonia Weltoniensis, Begonia Weltoniensis alba*, and *Begonia McBethii* are again coming into popular favor, and, in my opinion, no florist should be without them on his greenhouse benches in summer, as their many good qualities for decorative purposes in general still entitle them to a place in the front ranks of this numerous and useful class of plants. Many florists, who have dropped them from their lists, are again taking them up, ample evidence that they are still of service, and that there is nothing yet to surpass them for general usefulness amongst summer flowering begonias.

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And now a word on outdoor flowering plants in summer. 1st—Annuals, the prettiest, most varied and unfortunately, I must add, in many cases the most fickle and uncertain class of plants grown.



Malope Grandiflora Rosea.

It is gratifying to know, however, that there has been, during the last few years, more especially on the part of seedsmen and seed growers, a greater effort made, not only to introduce new species, but to improve generally the various strains and types of these useful adjuncts to a florists' establishment.

Time will not permit me to but barely touch on the subject of annuals, as it is unnecessary for me to even mention the staple varieties of many of them, such as Asters, Sweet Peas, Mignonette, Nasturtiums, Stocks, Phlox Drummondi, Cosmos, as well as Antirrhinums, Petunias and Verbenas—the last three being now generally acknowledged for all practical purposes as annuals—as all of these are well known to all classes of flower lovers, as evidenced by the beautiful display now on exhibition in connection with this convention.

But there are a comparatively few new varieties and types that may, perhaps, not be as generally known and cultivated as those I have mentioned. Take first of all the annual chrysanthemum. The beautiful colors and markings, as well as ease of culture, good keeping qualities, etc, well entitle these to the notice of all florists. For table and room decorative work, more especially, these annual chrysanthemums will be found to be invaluable. By sowing the seed early in the season, their decided and pretty flowers can be had early in August and September in abundance.

Another species of plants that will furnish material for the florists' use are the Malopes and Lavateras. These improved types of the Mallow class of plants will be found of great service for decorative purposes and for loose cut flowers, Malope grandiflora alba and Malope grandiflora rosea being the two varieties most useful to florists. *Lavatera rosea splendens*, *Lavatera alba splendens* and *Lavatera trimestrie* are good varieties, their large, showy, mallow-like flowers being often several inches in diameter; and for a convolvulus-shaped flower their keeping qualities are very good, as I have, by experimenting with them in this respect, kept their flowers and foliage quite fresh for three days under treatment similar to what they would receive as cut flowers for decorative work.



Annual Chrysanthemum.

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Another class of annuals coming into favor are the annual rudbeckias, the beautiful brown and dark crimson markings of the base of the petals of these flowers makes them more acceptable than they otherwise would be, taking into consideration the almost objectionable and overdone appearance of many flower gardens, by the too general use of masses and rows of yellow flowers, such as *Rudbeckia laciniata* (Golden Glow) and the deep-colored, heavy-looking sun-flowers. Several very much lighter shades of these annual Helianthus or Sunflower have recently been introduced, their soft lemon yellow and almost white flowers making them less oppressive and objectionable as florists' flowers than the deeper orange shades of the older varieties of sunflowers.



Cosmos.

There is one more annual I would like to mention, viz., *Argemone Grandiflora Alba*, or Mexican Poppy. Although the growth is coarse (3 ft.) the abundance of its pure white, petalled flowers will especially commend it to florists, as it gives an abundance of blossom during August if sown in the open border in April. This plant has a habit of closing its flowers when on the plant at night, and during dull weather, but when cut, it remains open constantly. Although the stamens in the centre of the flower are yellow, it is of such a soft shade and texture that this feature is not as objectionable as it is for florists' flowers. For short time work it ought to be of value to florists, as large white flowers are so scarce oftentimes before the Asters make their appearance.



Argemone Grandiflora Alba (Mexican Poppy).

Perennials.

I should like to have said a few words on perennials, but the time is so short and space will not permit except to say that the improvement in this class of plants are equally as noticeable as in that of annuals, and no general florist's establishment is complete without a collection of these useful and inexpensive class of plants. I have a few specimens of several of the varieties of plants that I have mentioned, amongst which will be found several varieties, such as *Helianthus cummerifolia, Helianthus decapulatus nanus*, that from their form and soft lemon yellow colors well recommend them to the notice of florists as useful summer flowering varieties.

In conclusion I would mention another class of plants that could be made of more service to florists in summer than they are at the present time, I have

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reference to the Hardy Climbers, more particularly the Clematis. The beautiful colors and shades of those that are now offered, from the pure white of the Duchess of Edinburgh variety, *C. paniculata* and *C. Henryi*, to the deep lavender color of Standishii or to the intense purple of the more common Jackmanni, will allow of no excuse for florists planting around and about their establishments—as we often see done—the common varieties of Ampelopsis and Clematis, when other kinds such as those I have mentioned might occupy to advantage and profit the places of the commoner kinds, and give results that would benefit their owners as well beautify their surroundings where planted.



Foxgloves.

I cannot close this rather lengthy, but I trust not altogether uninteresting, paper without again saying that although it is impossible and undesirable to supplant the queenly Rose, and I can almost say the kingly Carnation, in the estimation of the flower-loving public, still there are demands on florists that will sometimes not permit of the very general use of these as florists' flowers, especially at this season of the year, which, I trust, will be an acceptable apology and excuse for these remarks from me on "Summer Flowers for Florists."

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FERNS FOR THE HOUSE.

By Wm. Hunt O.A.C., Guelph.

The delicate and tender nature of many of the prettiest and most graceful growing varieties of this beautiful and interesting class of plants, prevents their being used very extensively for house decorative purposes. The dry, arid atmosphere of dwelling houses induced by artificial heating, more especially in winter, is particularly destructive to the delicate texture and formation of the fairy-like fronds of many varieties of ferns.

Ferns thrive best in a moist, humid atmosphere, and although these conditions cannot be given them to the same extent in a dwelling house as in a conservatory or greenhouse, or even where ferns are found growing amidst their natural surroundings, still much pleasure and satisfaction can be obtained by selecting suitable varieties, and by modifying as much as possible the unnatural conditions



Nephrolepis Bostoniensis.



Aspidium Coriaceum.

that surround all plant life in a dwelling house. In fact many varieties can be kept fresh and bright looking, grown as house or window plants, much longer than many varieties of foliage plants commonly used for house decorative purposes.

It would be a waste of time and energy to endeavor to grow the delicate Adiantum and similar tender species of ferns under ordinary conditions in a dwelling, or even in a window, the finely formed lobes of their tender fronds being particularly susceptible to the dry atmosphere, if even they succeed in making any progress at all in the way of growth.

Probably amongst the almost innumerable species and varieties of ferns known to floriculturists, there are none better adapted for house or window culture than the many types of the Pteris fern,

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sometimes called feather ferns from, the close resemblance many of these ferns have to the formation of a large feather.



Pteris Argyrea.

The long whip like, half-drooping fronds of Pteris serrulata, and the crested varieties of this Pteris, such as Pteris cristata and Pteris wimsetti, with the tips of their hard glossy green fronds more or less covered with the moss-like formation that give them the common name of crested ferns, are perhaps amongst the easiest grown and most enduring types of the Pteris, especially when grown as house or window plants.

Pteris cretica or Cretan Pteris is another variety that succeeds well in a dwelling house and is quite as easily grown as any variety of Pteris, in fact many prefer it to *Pteris serrulata* or the crested varieties, as being less liable to attacks of fern thrip and red spider, the two latter being the greatest insect foes of fern life.

Another variety, *Pteris hastata*, or Spear fern, specially commends itself to the indoor fern grower, not only from the fact that it is quite as easy of culture and as capable of resisting insect attacks as the other varieties mentioned, but the pleasing variation in its habit of growth makes it particularly acceptable either as a pot plant, or in the make up of a fern pan or fern dish.



Pteris Cretica.

The variegated type of *Pteris cretica*, viz.: *P. cretica alba lineata*, that takes its specific name (*alba lineata*) from the broad line of white that runs through the centre of each segment of its otherwise green fronds, is another variety that shows up splendidly amongst the plainer types of Pteris. In fact, in a well grown specimen, the white markings referred to often predominate sufficiently to make a plant of this variety quite a conspicuous object amongst a collection of ferns. The fronds of this fern are quite hard when matured, making it quite an easy task to sponge them occasionally to assist their growth, as well as to prevent attacks of insect pests.

All of the varieties of Pteris mentioned are of a comparatively dwarf habit the tough leathery texture, as well as the glossy surface of their fronds making them specially suited for house or window culture.

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Pteris longifolia succeeds well in a house, and retains its freshness for a long time, its stronger growing habit however making it more suitable for large collections of ferns, or for use in large jardinieres than for ordinary house or window culture.

The beautiful *Pteris argyrea* (Silver Pteris) is unfortunately of a very delicate nature and does not as a rule succeed well in a dwelling house or window. As a greenhouse or conservatory fern it cannot be excelled in beauty, either in form or color, the broad rich silver markings of its large graceful fronds make it an object of attraction to all fern lovers. It is seldom, however, that a perfectly grown specimen of this fern is seen, as it requires exceptionally good culture to produce a good specimen.



Pteris Serrulata.

The *Nephrolepis* (Sword fern) gives us several types very useful as house or window ferns. The popular Boston fern (*Nephrolepis Bostoniensis*) is perhaps the most graceful, as well as one of the easiest of culture amongst ferns, its long arching fronds making it particularly adopted for furnishing large jardinieres, mantles, etc. *Nephrolepis exaltata*, or the true Sword fern, is also a useful house or window plant but is not as robust as the Boston fern. The dwarfer growing types of this fern, *N. cordata* compacta, and *N. phillipensis* are useful ferns, but not as enduring or lasting in a house as *N. Bostoniensis*.

Another pretty and useful fern for house culture and one that until recently has been little seen, either as a house or window plant, is the dwarf, dense growing *Aspidium coriaceum* or leather fern deservedly taking the latter name from the extremely tough texture of its fronds as compared with many ferns This characteristic enables this fern to resist the bad effects that a dry atmosphere produces on ferns for a much longer period than many others. Its dense, dwarf habit is also another feature that recommends it either for the window or greenhouse, or for house decoration I have known plants of this fern retain their freshness for a longer period than many house plants such as palms and cordylines, without any extra care being bestowed on them.



Pteris Wimsetti.

The graceful-growing *Asplenium bulbiferum* cannot be omitted from the list of ferns suitable for a window or for house decoration, but it succumbs sooner to drouth and a dry atmosphere than some of the others I have mentioned. The long spear-like, hard fronds of *Asplenium marinum* (another distinct type of Asplenium) makes a most enduring and pretty fern for the house or window and is very easy to grow.

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Amongst our native ferns that are especially suitable for indoor culture is the dwarf growing Polypody. This fern is almost evergreen in character and differs but slightly, either in form or habit, from the English Polypody (*Polypodium vulgare*) both of which are most enduring ferns as house or window plants. I have used specimens of both the Canadian and English Polypody for house decorative plants for several years past, the plants having in almost every case retained their, fresh bright appearance for two or three months without any more care or attention than is usually bestowed on the best house plants, viz: Aspidistras, Cordylines, palms, etc., a fact that certainly placed them high in my estimation as house-plants. It is easy enough to secure a plentiful supply of the native Polypody, as it grows freely in almost every part of Canada, more especially amongst rocks and stones. Used solely as an occupant of the fern pan or as a pot plant, or mixed in with other kinds of ferns, these varieties of the Polypody are a valuable addition to the list of ferns suitable for house or window culture.

Another stronger and coarser growing fern, useful for house decoration or for the greenhouse, is the *Aspidum falcatum*, or as it is sometimes catalogued *Cyrtomium falcatum*, another iron-clad fern capable of resisting for a longer period than most ferns the atmospheric condition unsuitable to plants, usually found in a dwelling house.

Many other varieties of ferns could be mentioned as being suitable for house or window culture, but those given will be found sufficient to make a variety to supply quite a large window or for house decorative purposes.

A word or two perhaps on the culture and care of ferns may perhaps be acceptable.

There are very few ferns but delight most of all in soil of a light, porous nature. A compost should be made of one-half well rotted, clean, leaf-mould, the other half to be made up in equal parts of sharp, fine sand and loamy potting soil, the latter being enriched with a small quantity of dry pulverized cow manure. Mix this compost well together before using.

From the fact that ferns like plenty of moisture at the roots and around about them, the mistake is often made of not giving the pots they are to grow in a plentiful supply of drainage. This latter feature is very necessary when potting ferns or filling fern pans, as ferns will not live, to say nothing of thriving, in a sodded soil soured by stagnant water, especially when placed in a window or dwelling house. Use fully an inch of broken pots in all except perhaps very small pots, when the quantity of drainage can be reduced in proportion to the size of the pot.

Water ferns thoroughly at the roots when they require water, never allowing the soil to become anything approaching a dust dry condition; in fact with good drainage the soil should always be kept moist but not soddened.

When potting or re-potting ferns do not be too liberal as to the size of the pot; using a pot too large in proportion to the quantity of roots is detrimental to almost all kinds of plants, especially to house or window plants where the surroundings are not of a nature to induce quick root action so as to necessitate an abundance of room for the roots.

The fronds of most of the ferns I have mentioned can be easily washed with a small piece of soft sponge or some similar material, moistened with clean water. Syringing the growth with water from a fine atomizer spray will also be beneficial, or the growth of the plants may be dipped in a pail of water once or twice a week. This can be done by turning the plant upside down and allowing the fronds only to remain under water for a minute or so. By adopting these means before insects attack the growth, the destructive visits of the fern thrip and red spider can often be prevented, and the plants kept fresh and healthy looking.

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The insect pests that are most likely to prove troublesome are fern thrip and red spider; the green fly often makes its appearance, especially on the young fronds. Shaking or brushing off the green fly is probably the safest way to dispose of green fly; if tobacco water is used it must be made very weak. The presence of thrip and red spider will be first seen by the whitish appearance the fronds present, especially near the centre rib of each lobe or frond. Weak tobacco water applied to the growth, especially on the underneath side, is the best remedy for thrip. The fern thrip is a very minute insect and cannot be discerned with the naked eye. A magnifying glass will, however, reveal its presence, when it will be seen burrowed snugly between the upper and lower layers of film that constitute the frond. Nothing is better for destroying thrip on ferns than frequent applications of tobacco water. Frequent syringing and sprinkling the growth of ferns with clean water is one of the best preventives of the attacks of the almost invisible but destructive red spider, one of the worst pests of indoor plant life.

Ferns have during recent years become so popular and necessary as accessories to floral decorations, that a word or two on their culture and care may perhaps be interesting to readers of the *Journal*.

ROSE PESTS.

By Wm. Hunt, O.A.C., Guelph.

With the advent of June blossoms, and the increasing heat of the sun, insect pests are sure to make their appearance. The old adage, "that an ounce of prevention is better than a pound of cure" is one that flower lovers will do well to bear in mind, and apply practically its teaching at this season of the year.

Much of the success to be attained during the summer season, both in the flower and fruit garden, depends very largely on prompt and vigorous action in preventing the development and increase of the many kinds of insect pests that prove so troublesome and destructive in our gardens. Too often the application of remedies and preventive measures for the extermination of insect pests, etc., is left until the plants have become so badly infested that they are hopelessly spoiled for floral or decorative purposes for the greater part of the season.

How often do we see rose bushes with the foliage and buds partly eaten and destroyed by the rose-worm or slug, long before the buds have had time to develop even the faintest tinge of the gorgeous colors of their beautiful petals, when an early and timely application of a little dry hellebore powder, sprinkled over the bushes before the flower buds developed, would have prevented the disfiguration of the plants as well as the loss of the roses. I have found it a wise course to always give rose bushes a sprinkle of hellebore powder as soon as the foliage has partially developed, before the flower buds are showing very prominently. By doing this and repeating the operation about once a week, until the flower buds com mence to open out into flower, the foliage, as well as the flower buds can be saved from disfiguration and partial ruin. The best time to apply the hellebore is early in the morning, whilst the foliage is damp with dew.

Take again the rose-thrip, that is so troublesome to rose-growers from the time the rose buds appear until early autumn. This insidious little white fly, or

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midge, that secrets itself on the under side of the leaves, is oftentimes not detected until the foliage has become bleached and whitened by its destructive attacks. Its presence, however, can usually be detected if a close inspection of the foliage is made soon after the first leaves appear on the bushes. At this time the insects are so minute that it requires careful search before they can be seen. This is the proper time, however, to commence the application of insecticides, as if left until later, when hot, dry weather prevails, it is almost impossible to eradicate them from the bushes.

An application of tobacco in some form or other is the best and safest preventive of the development and increase of the rose-thrip. I have found that an application of dry powdered tobacco leaf, or dust, sprinkled once or twice on the bushes as soon as growth commences in early spring, and the operation repeated once a week until the flower buds are developing, has proved very successful in preventing the appearance of these troublesome pests of the rose grower.

A rather strong solution of tobacco water, made by pouring boiling water on tobacco, especially the raw leaves or stems, is a good preventive for the rose thrip. This solution should also be applied early in the season and at intervals as before recommended. There are several preparations specially prepared as insecticides that are very useful to the rose grower. Most of these preparations are largely composed of the essence of tobacco and are perhaps easier to obtain than raw tobacco. Nicoticide and Sulpho-Tobacco soap may be mentioned as amongst some of the best preparations of the kind. It should be remembered however that one application early in the season does more good than perhaps three or four will do later on, when the insects have become well established and numerous. A weak solution, made by dissolving about a teaspoonful of whale oil soap in two quarts of water, will prove of great service in preventing the the ravages of the rose thrip. The solution should be applied with a syringe or whisk to the underneath part of the foliage as much as possible.

Another enemy to the successful culture of the rose, is the red spider. Climbing roses are more liable to attacks from this little pest than are bush roses.

The red spider delights in a dry arid atmosphere, and roses that are trained near to, or perhaps close to, a wall or fence, offer splendid inducements for its attacks. These pests are also very minute and oftentimes hard to locate until they have done considerable mischief. The first intimation of their presence is the unhealthy, whitish appearance of the leaves, and finally the constant dropping of the dried, half-devoured leaves; unless they are stopped before they have reached this stage. Constant syringing and sprinkling with cold water is the best preventive of the appearance of red spider, as they cannot exist in a damp atmosphere. It is almost impossible to prevent the attacks of these little pests in climbing roses planted close against a house or wall having a south aspect. Those of our readers who have roses planted in such a position will do well to syringe or sprinkle their bushes with water well up to the time of flowering, and for the greater part of the summer after the flowering period, if they would have good healthy rose plants. An open, airy position suits roses the best. If planted against a wall or fence an east or northeast aspect is by far the best for their successful culture. The aphis or small green fly is also troublesome to rose growers. Constant syringing, or an application of tobacco water, usually rids the bushes very effectually of these less destructive insects than thrip, red spider, or the rose slug.

Those having rose bushes or similar plants that are liable to attacks from insect pests will find by using the different insecticides early in the season that much time and labor can be saved, and much better results obtained from their plants than by leaving the application of remedies until the insects have obtained a strong hold on the plants.

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NOTES ON CONIFERS.

By W. T. Macoun, Central Experimental Farm, Ottawa.

PINES.

When the ornamental grounds are large no trees are better adapted for giving character to a landscape and adding to the appearance of the buildings than the pines. They are stately and graceful, typical of strength, yet swaying and bending their branches with every breeze that blows. They are always green, and when the species are judiciously mixed or intermingled with other evergreens, the effect in winter is very fine. They afford considerable protection also, and partly on this account they are more suited for a northern exposure than anywhere else, giving a home an air of greater comfort. Pines are more difficult to transplant than many other trees, and the careless manner in which a maple or even an arbor vitae may be handled should not be taken as an indication that all trees will survive this harsh treatment. Pines have few fibres on their roots, and what there are, are easily destroyed. For this reason the roots should be kept well protected until planted.



Group of Evergreens in Arboretum, C. E. F., Ottawa.

Pines are very varied in their form and the color of their leaves, some being also much more graceful than others. Our native White Pine (*Pinus Strobus*) is one of the best and most graceful of them all. If this were a tree from some foreign country it would probably be more planted for ornamental purposes than it is at present. The Austrian Pine beside it appears stiff and formal. The leaves, or needles as they are sometimes called, are of a lively green shade, which helps to make it one of the best appearing pines in winter. The white pine succeeds admirably in almost any kind of soil, unless it be very wet, but seems to thrive best in good sandy loam. It is a rapid grower, averaging about two feet a year. Young trees ten inches high, planted in 1889, at the Central Experimental Farm, are now twenty feet in height. If good lawn specimens are desired, the trees should be planted when small, and if given plenty of room and cared for they will branch close to the ground and make beautiful trees.

Scotch Pine (*Pinus Sylvestris*). The Scotch Pine is planted more in Canada as an ornamental tree than the white pine. It is not as graceful a tree as the latter, nor its equal in any way, but it is a fine tree. It transplants easier,

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perhaps, than any other species of pine, and this may be one reason why it is so popular. The leaves are darker than those of the white pine, being of a bluish green color, which makes a fine contrast with those of the other species. It is a very rapid grower, and appears to succeed better on low land than the white pine. It will thrive well, however, in a great variety of soils, but it is best to plant it in a well-drained soil. Trees planted in 1888, when eighteen inches high, are now nineteen feet in height.



Red Pine *(Pinus resinosa).*

Austrian Pine (*Pinus Austriaca*). Next to the Scotch Pine, the Austrian is probably planted more than any other pine. It is a rather stiff appearing tree, but very symmetrical, and makes a fine lawn specimen, being compact, and, if good trees are planted, branching readily from near the ground. The leaves are dark green in color and very stiff. It is a slower growing tree than either the White or Scotch pines. Trees planted in 1889 when eighteen inches high are now sixteen feet in height.

Pinus Resinosa (Red Pine). The Red Pine is another native which has been used very little as an ornamental tree. At a distance, when young, it might be mistaken for an Austrian Pine, but on closer inspection the leaves will be found to be less rigid and softer to the touch. As the tree develops it becomes more graceful than the Austrian Pine, and is preferable in many ways.

Pinus Ponderosa (Bull Pine). This is a native of British Columbia, and also occurs in the Rocky Mountains in the United States. Very few specimens of this fine native tree have been planted for ornamental purposes in Canada, but where it can be grown successfully it should not be omitted. It is one of the most handsome species. The long glaucous green leaves, sometimes twisted into peculiar forms, and its upright branches give it a majestic appearance, and make it a very noticeable and attractive object. It is a rapid grower when once established, a specimen planted in the Arboretum in 1890 when fifteen inches high, being now fourteen feet eight inches in height. It is one of the most difficult pines to transplant, as there are very few fibres on the roots. Great



Bull Pine *(Pinus ponderosa).*

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care should be taken to not allow the roots to become dry. The trees should not be more than eighteen inches high when planted, after which they should be well looked after.

Dwarf Mountain Pine (*Pinus montana Mughus*). On account of its dwarf, compact and symmetrical habit of growth, and its generally attractive appearance, this is a very desirable pine. It is a native of the mountains of Central Europe, but succeeds admirably in this country. The foliage is very similar to that of the Scotch Pine in some respects. It is a low-growing tree, never probably attaining a height of more than ten to fifteen feet. Some specimens are dwarfer than others. This is a very desirable tree.



Pyramidal Arbor Vitae.

Swiss Stone Pine (*Pinus Cembra*). This pine is a native of Central Europe and Northern Russia. It is pyramidal in form, with foliage somewhat resembling that of the White Pine, but while the latter is a loose-growing tree, the Stone Pine is very compact, and is one of the slowest growing trees on the Experimental

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Farm. A specimen planted in the Arboretum in 1889 when nine inches high, is now only two feet four inches in height.

Other pines which have been tested at the Central Experimental Farm and have proved hardy so far, are *Pinus contorta* and variety *Murrayana*, natives of the Rocky Mountains and coast ranges; *P. densiflora* and *P. Thunbergii*, natives of Japan, and *P. Penke*, native of Macedonia.



Alcock's Spruce.

The pines are all interesting, and most of them very ornamental. They should be planted in greater variety than they are at present.

Arbor vitae.

Among evergreens there are few as satisfactory as the different varieties of American Arbor vitæ. At the Central Experimental Farm there are now fifty-one distinct forms growing, which vary much in foliage and habit of growth from the dwarf and compact "Little Gem," which is only a few inches high, to the pyramidal Arbor vitæ which rises straight and full in striking contrast to it. The American Arbor vitæ adapt themselves to a great variety of soils, and it is only on the heaviest clay and lightest sandy soils that they fail to make satisfactory growth. This adaptability to so many different situations is one of the reasons they are so valuable for ornamental planting. Another important reason why they are so desirable is that they are all perfectly hardy, as the ordinary form grows in the coldest parts of Ontario and Quebec. Owing to the dwarf, or semi-dwarf, habit of most of the varieties, they are very useful for small grounds where there is not room to grow anything which will reach a great size. Some of the varieties are so distinct in shape, such as *compacta*, *globosa*, *pyramidalis* and *Hoveii*, that visitors to the Experimental Farm are often led to believe that they have been pruned to their several shapes until informed to the contrary.

Out of the large collection the following are selected as being among the best as regards form and color of foliage:

Douglas' Golden Arbor vitæ (*Thuya occidentalis aurea Douglasii*: For those who are fond of yellow-foliaged evergreens this is a very desirable one. It is of a fine, upright form, with bright golden leaves which retain their yellow

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color well in the winter, making this tree very attractive at that time of the year. Contrasted with darker kinds it makes a good effect.

Compact Arbor vitæ (*Thuya occidentalis compacta*): This is a compact, dwarf variety with bright green foliage and is very pleasing to the eye. There is a variety, Parson, which is particularly good.

Ellwanger's Arbor vitæ (*Thuya occidentalis Ellwangeriana*): Although this variety does not grow very tall, specimens from twelve to fourteen years old being about four feet high, it is a vigorous growing sort and spreads out well. It is a compact variety and has slender leaves and branches which give it a less stiff appearance than some other varieties.

Hovey's Arbor vitae (*Thuya occidentalis Hoveii*): This is one of the finest and most attractive varieties. The leaves are bright green and the branches flat and parallel, giving the shrub a very remarkable but pleasing appearance. It does not grow very tall, specimens from twelve to fourteen years of age being only between four and five feet high.



Group of Conifers at C. E. F., Ottawa.

Pyramidal Arbor vitae (*Thuya occidentalis pyramidalis*).—The pyramidal Arbor vitae is one of the most distinct in form. It is a compact and very upright grower, being quite columnar in form, which makes it a very conspicuous object wherever planted.

Siberian Arbor vitae (*Thuya occidentalis wareana Sibirica*:—The Siberian Arbor vitae is one of the best known varieties. It is of compact habit, and while not so dwarf as some others, it does not grow very tall. The leaves have a blunt appearance, which distinguishes it from most varieties, and their deep bluish green color is also quite distinct.

Thuya occidentalis Columbia:—Of those varieties of the American Arbor vitae which have variegated foliage this is one of the best. The tips of the leaves, which are rather blunt, are whiter than most of the other variegated forms, and the contrast between the lighter parts and the green is, therefore, more marked. This is a very beautiful variety.

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SPRUCE.

There are a good many species of spruce, and of the Norway spruce especially there are a great many varieties, but there are few of them which are better than the ordinary forms. The Norway spruce (*Picea excelsa*) is one of the best evergreens that will grow in this country. It is hardy, of rapid growth and good form, and possesses more good points than any of the other species.

The Rocky Mountain Blue Spruce (*Picea pungens*) is a very handsome tree. It lacks the graceful form of the Norway, but if a good specimen of the glaucous form is procured there will be nothing found to equal the beauty of the steely blue foliage. This tree is a slow grower and it takes some time before it reaches a great height. The beautiful specimens growing at the Central Experimental Farm are the wonder and admiration of all visitors. This species varies much from green to steely blue, and in ordering this tree the blue variety should be asked for.

Among the newer spruces there are none of the hardier species which equal Alcock's spruces (*Picea Alcockiana*) in beauty. It is a native of Japan and there attains a height of from forty to sixty feet. It is quite distinct from other species. The upper surface of the leaves is dark green, and the lower surface is bluish, silvery-green, and the contrast gives the tree a very attractive appearance. The cut of this spruce, which was produced from an excellent photo taken by Mr. F. F. Shutt, gives some idea of the character of it.

The native White Spruce (*Picea alba*) is not to be ignored. When given plenty of room where it can develop symmetrically it makes a handsome tree. The White spruce varies much in the color of the foliage, and by a careful selection specimens may be obtained which almost equal the Blue spruce in beauty of coloring. If one cannot afford to buy trees of other species one can get much satisfaction from growing a White spruce. The trees should be planted when quite young to get the best results, and they should be branched almost to the ground. If larger trees are planted they are liable to be scraggy or will become so



Fruit Exhibit at Annual Meeting. British Columbia Apples in the foreground.

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Fruit Exhibit at the Annual Meeting. General view of apple tables.



Fruit Exhibit at Annual Meeting. Showing apples and peaches (bottled), grown on the grounds of the Lake Huron Experiment Station, Walkerton, Ont.



Fruit Exhibit at Annual Meeting. Showing a large assortment of grapes from the Wentworth Fruit Experiment Station at Winona, Ont. Apples from the St. Lawrence Valley and Bay of Quinte districts.

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HOW TO BUILD A ROCKERY.

By F. B. Greening, of the Hamilton Horticultural Society.

Why many fail to attain success with their rockeries is because a few simple but necessary rules are neglected in their construction. It must be remembered particularly that the pockets should be made sufficiently large and deep for the roots to penetrate in search of nutriment and moisture. Many rockeries are deficient in this respect, and the plants are stunted for want of proper food, and succumb to the first protracted dry spell. The Hamilton City Improvement Society, in order to encourage the building of rockeries, is offering this season a series of prizes, and all citizens can compete. In order to assist any who may be making themselves a rockery the following suggestions are given.

After deciding upon the most desirable site, the ground should be excavated of the depth of about eight or ten inches and filled in with broken bricks, stones, or rough material for drainage. On this place a layer of decayed vegetable matter and rough mould, then finish off with a foot or two, according to the height required, of the best mould you can get mixed with well rotted manure. The soil should be thoroughly well firmed to avoid undue sinking when the earth settles. Now fix your rocks, starting at the outside of the mound, forming pockets not less than 12 inches across, most of them considerably larger. The rocks should be partially buried in the soil and pushed well in, then put some cement at the joints to keep the rocks in their place, and it is as well to wash each rock, or dip it in a pail of water, to ensure there being no dirt that would prevent the cement adhering. After completing the lower series of pockets gradually build up towards the top, one row of pockets at a time and in irregular and diversified shapes, trying to avoid too formal outlines. This is important if a natural effect is to be attained. Fill up the pockets with fine loam, sand, and black earth, well mixed together. The rockery in this way can be built up three or four feet high, if necessary, and you will have a series of beds wherein you can grow your flowers or ferns to perfection.

The choice of material in Hamilton is fortunately large; suitable waterworn stones can be collected along the face of the mountain and in the ravines. In England, where rockery building has become almost an art, instead of natural stone they are now using clinkers or slag, which can be procured from founderies or smelting works. The pieces of slag should be as large and irregular in shape as possible. These can be used as they are, or a better effect can be produced by covering the slag with a thin solution of cement and sprinkling with sand, making a very pleasing effect. Pieces of marble, shells, glass, etc., should on no account be used, such materials being utterly out of character with the beautiful foliage of the plants. The whole aim should be for the arrangement to be as natural as possible.

In furnishing the rockery with plants, it is necessary when making your selections to consider the aspect. If it is shaded and comparatively sunless, you must not try to grow any but plants that thrive in such situations, and for such rockeries it is recommended that ferns should be largely used. There are comparatively few people who appreciate the vast variety of native ferns to be gathered within an easy driving distance of Hamilton. There are enthusiastic collectors in the city who have upwards of thirty distinct varieties of native ferns transplanted to their gardens from the neighboring woods and ravines. In addition to the ferns, there are many native wild flowers suited for the shady rockery, such as columbines, anemones, hapatica, arbutus, gentian, and many others. Some of the cultivated plants recommended for shaded places are the foxglove, larkspur, German and Japan iris, lily of the valley, Canterbury bell

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ribbon grass, etc.; also a variety of bulbs may be planted for spring flowering, such as crocus, daffodil, and tulip, which need not be disturbed from season to to season.

For rockeries with a sunny exposure, all the glorious wealth of garden plants may be used and a perfect blaze of color can be relied upon all summer with very little attention. The rock pockets keep the roots of the plants cool and moist, and the sunshine will bring out to the full nature's wealth of color in all its brightest and loveliest forms. Oriental poppies, perennial phlox, campanula, peonies, gaillardia, dicentra, ornamental grasses, alyssum, funkia, etc., also many climbing vines may be planted and allowed to run over the whole, making an exceedingly pretty effect. Climbing nasturtiums should be planted, particularly, also the lathyrus (everlasting pea).

There are many shady situations where rockeries can be placed to advantage on lawns where the grass cannot be made to grow, or such gardens as are not large enough to have a satisfactory lawn should be made into rock gardens as described. There are also many odd nooks and corners that could be utilized that now are harboring places for waste paper and rubbish.

At Messrs. Upton's factory on Ida street is to be seen a form of rockery that should be universally adopted by householders with corner lots, it being built across the lawn as a barrier to prevent the public making a short cut, and it has been a source of much pleasure to passers by and residents in that neighborhood. Why cannot more of our enterprising manufacturers spend a little time in beautifying the surroundings of their factories? Besides being appreciated by the public, it is an inspiration and example to their workmen to better their own house surroundings.

LAWNS, HOW TO CARE FOR THEM.

By A. Alexander, of the Hamilton City Improvement Society.

Nothing is more beautiful around our homes and along our streets than a well-kept lawn. Crisp lawns, all dim with early dew, or smooth in evening warmth of barred sunshine, are alike redolent of pleasure to the beholder's eyes. As John Ruskin says, when writing of a blade of grass, "Made as it seems only to be trodden on to-day and to-morrow to be cast into the oven, and a little pale, hollow stalk leading down to the dull brown fibres of roots. And yet, think of it well, and judge whether of all the gorgeous flowers that beam in summer air, and of all strong and goodly trees, pleasant to the eye or good for food, there be any by man so deeply loved, by God so highly graced, as that narrow point of feeble green."

Where the soil has been properly prepared by rather deep digging and enriched with thoroughly rotted stable manure, or an artificial fertilizer, such as ground bone and muriate of potash, there will be no trouble in having a good lawn, for the roots of the grass must be able to reach down and find moisture and food. The artificial fertilizer referred to is made up of five parts of ground bone to one of the muriate of potash, and five pounds of this mixture to be used for every square rod of ground. This mixture to be worked into the soil before seeding or sodding.

A top dressing of the muriate of potash alone, at the rate of one half pound to the square rod two or three times during the season, will be of great benefit, especially if sown before a shower. Hard-wood ashes, unleached, are of great

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benefit sown on the lawn in spring. Last year I could see the beneficial effect of this in two weeks after being applied. The muriate of potash and ground bone are worth about five cents per pound, and less in large quantities.

In making new lawns or renewing them it is not absolutely necessary to use sod. Sowing a mixture of lawn grass as sold in the seed stores in April will be ready for the mower in July, and next year will be as good as if sodded, and at half the price. The covering of lawns with rank stable manure in the fall is to be avoided; it is very unsightly, and tends to produce a rank, unhealthy growth. A top dressing of thoroughly decayed manure or vegetable humus applied early in the spring, and broken or levelled in with the back of rake, when nothing better can be got is good. It is injurious to a lawn to have the sprinkler going when not absolutely necessary It tends to produce a weak, unnatural growth, and washes all the food on which the grass feeds away below the roots, impoverishing the upper soil.

I am often asked if I leave the grass on the lawn after mowing. I answer, No. If the mower is not provided with "catcher," the grass should be raked off at once with a grass rake or swept off with a besom.

The question of how to get rid of weeds in the lawn is a very troublesome one. There is nothing we can use to destroy the weeds that will not destroy the grass also. Dandelions can be kept down by cutting them below the ground with a sharp knife. Wherever there is a healthy growth of grass there will be no trouble with weeds, for there will be no room for them. In the shade of trees or fences it will be observed that the grass is weak and the weeds strong. Sometimes chickweed, ground ivy, self-heal and a variety of speedwell infest a lawn in patches, a sharp steel rake may get rid of these to some extent, but when they get a hold and become unsightly the best plan is to skin the whole patch, stir up and enrich the soil and sow some clean grass seed. The using of stable manure for top dressing, as referred to above, is responsible for many of the noxious weeds which mar our lawns.

Once a week is often enough to mow the lawn. Mossy places in a lawn indicate sourness or poorness of the soil. Treat them as for the weeds above mentioned; top dress with fine rich compost.

Frequent use of a heavy roller over the lawn is of great benefit, especially when the lawn is soft, and as soon as the frost is out of the ground and throughout the season.

You roll it as I advise, and it is stronger the next day. You mow it as I advise, weekly; and it multiplies its shoots as if it were grateful. Let us then care for our lawns and deal generously with them, and thus add another charm to our city's adornment.

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NINTH ANNUAL REPORT

OF THE

FRUIT EXPERIMENT STATIONS

OF

ONTARIO,

UNDER THE JOINT CONTROL OF THE

ONTARIO AGRICULTURAL COLLEGE, GUELPH

AND THE

FRUIT GROWERS' ASSOCIATION OF ONTARIO

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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Printer to the King's Most Excellent Majesty.

1903.

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TORONTO.

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NINTH ANNUAL REPORT

OF THE

ONTARIO FRUIT EXPERIMENT STATIONS

1902.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—In presenting to you the Ninth Annual Report of the Fruit Experiment Stations of Ontario, we desire to call your attention to a number of new fruits reported upon for the first time in Canada, to the alphabetical arrangement of matter, and to the revised copy of the Fruit Catalogue, in the yearly revision of which we invite the aid of fruit growers in every section of the Province.

We have the honor to be, Sir,

Your obedient servants,

JAS. MILLS, Chairman.
LINUS WOOLVERTON, Secretary.

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BOARD OF CONTROL, 1903.

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The Chairman, the Official Inspector, and the Secretary of the Ontario Fruit Growers' Association.

THE ONTARIO FRUIT STATIONS.

Name.	*Specialty.*	*Experimenter.*
1. Southwestern	Peaches.....	W. W. HILBORN, Leamington.
2.	.....	
3. Wentworth.	Grapes.....	MURRAY PETTIT, Winona.
4. Burlington.....	Blackberries and Currants	A. W. PEART, Freeman.
5. Lake Huron.....	Raspberries.....	A. E. SHERRINGTON, Walkerton.
6. Georgian Bay.....	Plums	J. G. MITCHELL, Clarksburg.
7. Simcoe	Hardy Apples and Hardy Cherries .	G. C. CASTON, Craighurst.
8. East Central.....	Pears and Commercial Apples	R. L. HUGGARD, Whitby.
9. Bay of Quinte....	Apples.....	W. H. DEMPSEY, Trenton.
10. St. Lawrence.....	Hardy Plums and Hardy Pears	HAROLD JONES, Maitland.
11. Strawberry Station	.....	E. B. STEVENSON, Jordan Station.
12. Gooseberry Station	.....	STANLEY SPILLETT, Nantyr.
13. Maplehurst	General collection of all kinds of fruits for descriptive work for "Fruits of Ontario"	L. WOOLVERTON, Secretary.
14. Algoma.....	Hardy Fruits.....	C. YOUNG, Richard's Landing.
15. Wabigoon	Hardy Fruits.....	A. E. ANNIS, Dryden.

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FRUITS OF ONTARIO.

DESCRIBED AND ILLUSTRATED BY MR. L. WOOLVERTON, SECRETARY OF THE ONTARIO FRUIT EXPERIMENT STATION.

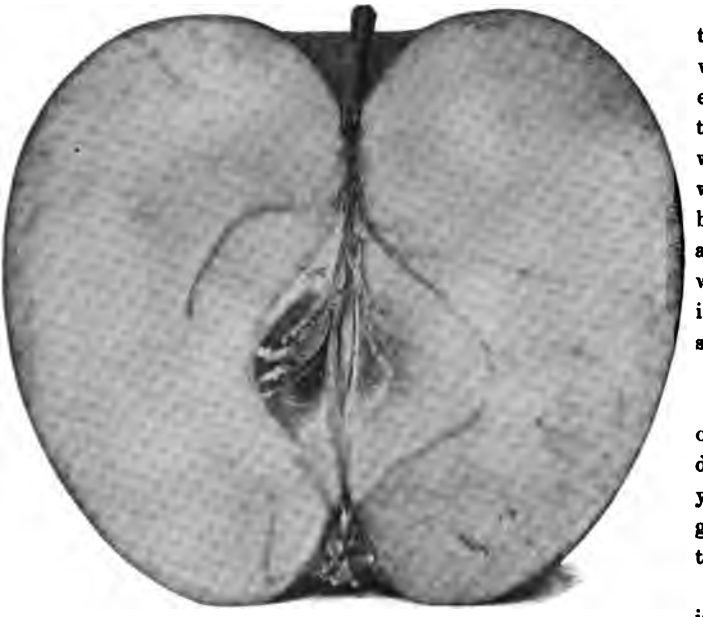
Fruit growing has become so important an industry in the Province of Ontario, that it deserves every encouragement at the hands of the Department of Agriculture. The Canadian farmer who contemplates growing fruit asks for information on two points in particular, viz., (1) What fruits shall I plant, and (2) How shall I cultivate them? The latter of these questions it is the province of the Ontario Fruit Growers' Association to answer through the Canadian Horticulturist and the Annual Report, while the former question is one that can be solved only by years of patient experimental work by our fruit experiment stations.

Of equal importance is some means of identifying all varieties now grown in our Province, and of knowing with some degree of exactness the size, color, general appearance and real value of these varieties aside from the catalogues of the nurserymen. To meet this latter need, the Secretary, with the advice and approval of the Board of Control, has begun the work of illustrating and describing the fruits of Ontario; and in this work he desires to acknowledge the valuable aid of the various fruit experimenters. The illustrations are all new and original, having been engraved from photographs made the exact size of the fruit samples, except where otherwise specified, and in this way there will in time be made accessible to the Ontario fruit growers a complete guide to all the fruits grown in the Province. Such a work necessarily must be slow and tedious, but it is all important that it should be characterized by scientific accuracy, and the writer invites notes or criticism from pomologists generally.

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APPLES.

STARK.



SECTION.

The Stark has been tested in a commercial way in Ontario by our experimenter near Trenton, Mr. W. H. Dempsey, who considers it a good winter apple for export, being about as profitable as Ben Davis, and somewhat better in quality; its dull red color is a serious fault.

ORIGIN: Ohio.

TREE: A stout vigorous grower, very productive each alternate year; foliage, large, dark green, somewhat subject to fungus.

FRUIT: Large, 3½x3½ inches; form, roundish, slightly one-sided, somewhat oblong conical; skin, covered with shades and splashes of light and dark red on a greenish yellow ground, thickly sprinkled with brown dots; stalk, one-half inch long, stout, in a small cavity of medium depth; calyx, large, half-closed, in a large, shallow, plaited basin; flesh, yellowish white; texture, a little coarse, firm and moderately juicy; flavor, mild, sub-acid, good.

SEASON: January to May.

QUALITY: Dessert, poor; cooking, good.

VALUE: Home market, fair; foreign market, good.



STARK.

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BLACKBERRIES.

AGAWAM.

A profitable variety, and a favorite for the table.

ORIGIN : Found growing wild by John Perkins, Ipswich, Mass., about 1870.

PLANT : Hardy, vigorous and productive, resistive of drouth.

BERRY : Oblong, medium size $\frac{7}{8}$ by $\frac{3}{4}$, black, sweet, tender and of good flavor.

SEASON : Mid-summer ; in 1900 it ripened at our Burlington station July 25 to August 10.

ADAPTATION : Succeeds in nearly all fruit sections. G. C. Caston. of our Simcoe station, names it as one of the best in his district, and says the plants at his station are hardy, healthy and productive.



AGAWAM.



MINNEWASKI.

MINNEWASKI.

Introduced with great flourish, but it has proved disappointing, except in the place of origin, because tender and unproductive.

ORIGIN : By A. J. Caywood, of Marlboro, N. Y.

PLANT : A stout, vigorous, upright grower, but unproductive and tender.

BERRY : Large, oblong, ($\frac{7}{8}$x$\frac{3}{4}$ at Burlington station in 1900), dull in color, and of fair quality.

SEASON : July 20 to August 10, (Burlington station, 1900).

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SNYDER.



SNYDER.

A popular variety in the commercial fruit garden, because of its productiveness; very reliable in the colder sections, but not very desirable for the table because of its inferior quality.

ORIGIN: On farm of Henry Snyder near Laporte, Indiana, about the year 1851.

PLANT: A vigorous, stout, upright grower, hardy and very productive.

BERRY: Medium size, ($\frac{7}{8}$x$\frac{3}{4}$ at Burlington in 1900), roundish, firm and carries well.

SEASON: July 18 to August 5, (at Burlington in 1900).

CHERRIES.

CALIFORNIA ADVANCE.

A fine Duke cherry, so similar in both season, and in character to the Late Duke, that we are inclined to think the two identical. Introduced by the Stark Nurseries of Louisiana, U.S.

LATE DUKE, (ANGLAISE TARDIVE.)

The most desirable of cooking cherries, because of its mild agreeable acid; and probably the most profitable of the Dukes, because (1) of its productiveness, and (2) of its season, which is between the Early Richmond and Montmorency. This and May Duke, which precedes it about two weeks, cover the early part of the season for cooking purposes; while Montmorency Kentish) and English Morello extend the season of cooking cherries to the 1st of August.

TREE: Habit, upright; very vigorous and very productive; Duke.

FRUIT: Large of its class, $\frac{3}{4}$x$\frac{3}{4}$ of an inch; form, roundish, slightly flattened; color, partly covered with bright red, but rich, dark red when fully ripe; stalk, 1$\frac{1}{2}$ inches long, inserted in a shallow cavity; suture, traceable; flesh, creamy white, tender and juicy; flavor, very mild, agreeable acid.

SEASON: July 1 to 30.

QUALITY: Good for dessert; best for cooking.

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CALIFORNIA ADVANCE.



LATE DUKE.

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CAMPBELL'S EARLY.

This grape is claimed to be an improved Concord, and being in season with Moore's Early should be a most valuable commercial variety. We have still to study the vigor of the vine and its productiveness, not yet being satisfied that it is in these respects equal to the Concord.

ORIGIN: Ohio, by G. H. Campbell; the product of different crosses from Hartford, Concord, and Moore's Early, through Muscat Hamburg. Introduced in 1896.

VINE: Vigorous, healthy and productive.

BUNCH: Large shouldered.

BERRY: Large, sometimes one inch in diameter; skin, black, with thin blue bloom, tough; flavor, rich and sweet without foxiness; flesh, meaty, sweet, tender; seeds, small, separate easily from the pulp; hangs to vine well.

QUALITY: Fine for dessert.

VALUE: First-class for market.

SEASON: Nearly as early as Champion.

ADAPTATION: Recommended for general trial.



CAMPBELL'S EARLY.

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DIAMOND.

(*Moore's Diamond.*)

A grape that is growing in popularity, and which succeeds in sections farther north than the Niagara.

ORIGIN : Brighton, N. Y. in 1873, by Mr. Jacob Moore, from seed of Concord, fertilized with Iona ; just one year after the Niagara was originated at Lockport.

VINE : Vigorous and productive, though not equalling the Niagara ; foliage much like that of one of its parents, the Concord.

BUNCH : Large, 5½ x 3½ inches ; compact and shouldered.

BERRY : About ¾ of an inch in diameter and adheres firmly to the stem ; color greenish white, yellowing slightly at maturity ; pulp, tender ; flavor, juicy, sweet and good.

QUALITY : Dessert, very good, superior to the Concord ; the Michigan station gives it 8, the Concord 6 and the Delaware (the highest) 10.

SEASON : About one week in advance of the Concord.

ADAPTATION: Reported as very desirable at the Simcoe station ; worthy of trial generally.



DIAMOND.

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PEACHES.

ST. JOHN.

(Yellow St. John.)



ST. JOHN.

The earliest really good peach for either home use or market. Its season is the end of August, just before the Early Crawford; and its fair size, its yellow flesh, attractive skin and good quality, make it one of the most satisfactory peaches for all purposes.

ORIGIN: North America.

TREE: Vigorous and productive.

FRUIT: Round, large, 2½ x 2½ inches; skin, yellow, with dark red cheek; suture, traceable on one side, sometimes by a red line; apex, a tiny point in a rather deep depression; freestone.

FLESH: Color, yellow, tinted red at the stone; texture, tender and juicy; flavor, sweet, rich and agreeable.

SEASON: August 20th to September 1st.

QUALITY: Dessert and cooking, very good.

VALUE: Market, first-class, the best of its season.



SECTION.

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PEARS.

EASTER BEURRE.

Among the desirable pears to grow for export we must not overlook the Easter Beurre, which, though green and unattractive in appearance at time of harvesting, keeps well through the winter, is an excellent shipper and is very good in quality. A warm climate and favorable soil seems to be necessary to its best development, and accordingly we find it planted for commercial purposes in the Californian pear orchards. On deep, rich, sandy loam, in the southern parts of our Province, it succeeds well, either as a dwarf, or as a standard tree.

Although some writers have claimed that this pear originated in France, because some old trees were found near Laval, yet the majority agree that the variety originated in Belgium, at the old University town of Louvain. Van Mons, in his Album de Pomologie in 1847, says, "This variety was found in the ancient gardens of the Capucins, at Louvain, where the original tree still stood in the year 1825, under the name of Pastorale de Louvain."

In the old countries, much confusion has existed regarding the names of pears, and subsequently much difficulty exists in the identification of varieties; this pear, for example, is given no less than twenty-four different names in Leroy's Dictionnaire de Pomologie, as, for example, Doyenne de Printemps, Canning, Beurre d'Hiver, etc., the last being adopted by LeRoy; while Hogg, of England, and Downing, of America, both adopt the name so well known to us, Easter Beurre.

TREE: Fairly vigorous, upright and productive, and may be grown either as a dwarf or as a standard tree, if as a standard, it needs good, rich soil and a warm climate for the best success. In Great Britain it does not seem to succeed as well as in Canada, for Hogg says it frequently happens that this delicious pear is of an indifferent and insipid flavor, which is caused by the unfavorable soil; and Blackmore, of Teddington, says, "It cracks in spots and is seldom very good." Our experience with it, as grown on a dwarf tree, is favorable.

FRUIT: Above the medium size, irregular obovate; skin, pale green at harvesting time yellowing somewhat toward maturity, with numerous russet dots, russet patches around the stem and calyx, and often a brownish check; stem about one inch long, stout, swollen at the base, set in a narrow, deep cavity; calyx small, closed, set in a much plaited basin of moderate depth.

FLESH: White, fine in texture, melting and juicy; flavor, sweet, rich and agreeable.

SEASON: January to May, under ordinary conditions.

QUALITY: Dessert, good.

VALUE: Export, good.

Adaptation: Southern parts of the province.

HOOSIC.

A remarkably large and excellent pear, as tested at Maplehurst grown as a dwarf, and it promises to be an excellent commercial variety.

ORIGIN: Seedling from Hacon's Incomparable, by Asahel Foote, of Williamstown, Mass.

TREE: On quince stock, healthy, vigorous and productive.

FRUIT: Size, large to very large, $3\frac{1}{2}$ x $3\frac{1}{4}$ inches; form, obtuse pyriform, somewhat one-sided; skin, yellow, with light red in sun, and with russet dots; stem, $1\frac{1}{4}$ inches long, stout, curved, set in a small, irregular cavity; calyx, small, open, set in a broad, uneven basin.

FLESH: White, tender, fine and moderately juicy; flavor, rich, perfumed.

SEASON: Last half of September.

QUALITY: 1st class for all purposes.

VALUE: 1st class for market.

Grown at Maplehurst, as a dwarf, this pear has given the greatest satisfaction; and, only that its season is rather short, it would be commended as an export variety.

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SECTION OF EASTER BEURRE.



EASTER BEURRE.

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Hoosic.

Section of Hoosic.

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PITMASTON.

PITMASTON.

(*Pitmaston Duchess d'Angouleme.*)

A very promising variety, succeeding well as a dwarf; its large size, good shipping character, fine quality, and regular form, seem to make it very valuable for export. The fruit is too large to be grown as a standard.

ORIGIN: Raised by John William, of Pitmaston, England; a cross between Duchess and Glout Morceau.

TREE: A very vigorous grower, and quite productive.

FRUIT: Very large, 4 X 3¼, oblong, obovate, obtuse pyriform; skin, pale yellow, with light russet in cavity; stem, stout, 1½ to 1⅝ inches long, set in a small cavity; calyx, prominent, half open, set in a very shallow, shouldered basin.

FLESH: Color, creamy white; texture, very fine, melting and juicy; flavor, very pleasant, aromatic, sometimes a little puckery.

SEASON: September and October.

QUALITY: Good, not quite equal to that of Duchess.

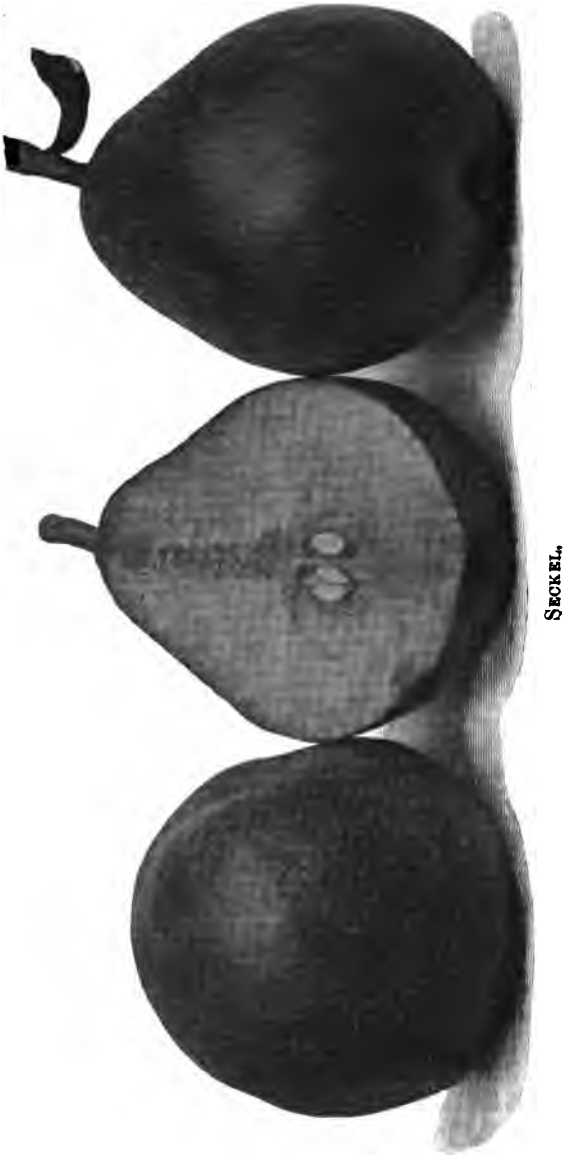
VALUE: First class for market.



SECTION OF PITMASTON.

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THE SECKEL PEAR.



SECKEL.

The finest dessert pear in cultivation, and one that should never be omitted from the garden, when planting pears for home use. Downing calls it "The richest and most exquisitely flavored variety known." At Maplehurst it has been grown both as a dwarf and as a standard; in the former case with the most satisfactory results, but in the latter, smaller, less highly flavored and less attractive in appearance.

Its small size rules it out of the commercial orchard, unless one can cultivate a very special demand among a certain class of consumers who will appreciate its high quality.

ORIGIN: On the farm of Mr. Seckel, of Philadelphia, near the Delaware river, where in 1884, the original tree was still standing, aged one hundred years and having reached the height of thirty feet. The Seckel was introduced into England, into the garden of the Horticultural Society, in 1819.

TREE: Healthy, hardy, and productive; forms a compact symmetrical head; wood, olive brown in color, stout and short jointed; succeeds best as a dwarf.

FRUIT: Size, small, two inches by one and three-quarters; form, obovate, regular and even; color, dull brownish green, yellowing as it ripens with a deep brownish red cheek; stem, half an inch in length, in a very small cavity; calyx, small, open, in a shallow basin.

FLESH: White, very fine grained, melting and juicy; flavor, honey-sweet, rich, spicy with delicate aroma.

QUALITY: Dessert, best; cooking, good.

SEASON: September to October.

VALUE: 1st class for a special market; but second class where not known, on account of its small size.

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TRIUMPH.

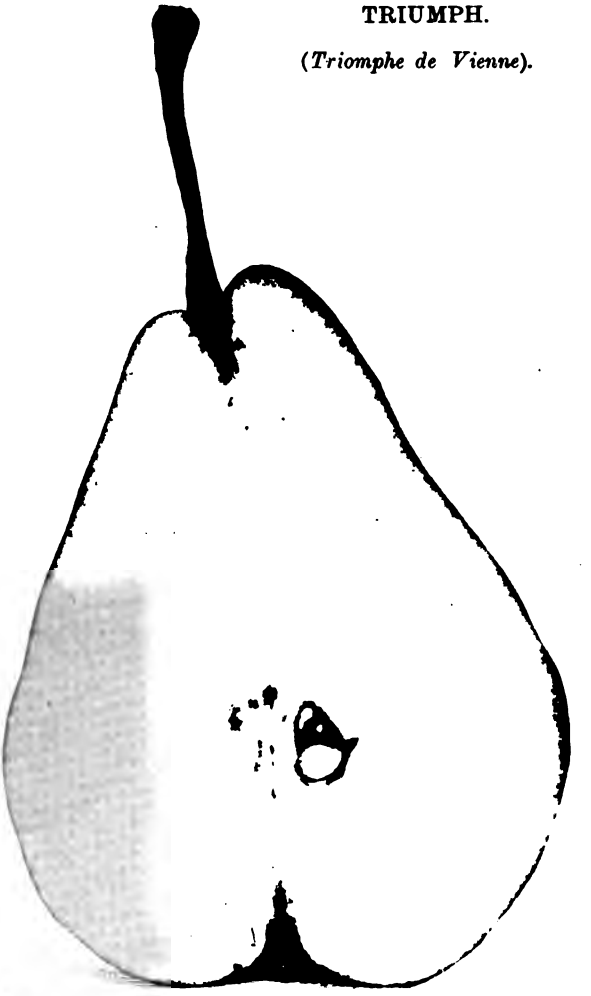
(*Triomphe de Vienne*).

A very fine, large, showy pear, a trifle later than Bartlett, larger in size, but not equal to it in quality; promising as a commercial variety.

ORIGIN: France?

TREE: A thrifty, upright grower, productive.

FRUIT: Large, 4 inches by $2\frac{3}{4}$; form, obovate, pyriform, somewhat uneven and irregular; skin, greenish yellow, with patches of russet; stem, $1\frac{1}{4}$ inches long, set in a shallow, uneven, often one-sided cavity; calyx, open, in a broad, irregular, russeted basin.



SECTION OF TRIUMPH.



TRIUMPH.

FLESH: Creamy white, very juicy; flavor, rich, sweet and excellent.

SEASON: September 15th to 30th.

QUALITY: Dessert very good; cooking very good.

VALUE: Market, home or foreign, 1st class.

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PLUMS.

ABUNDANCE.

One of the best of the Japan plums for the home garden. It is early in season, being ripe about the middle of August, and maturing quite unevenly. To get its best flavor it should be picked while still firm, and ripened indoors like a Bartlett pear ; it will color beautifully and become very juicy, and the flavor will be sweet and rich.

ORIGIN : One of Luther Burbank's importations from Japan in 1884.

TREE : Vigorous ; a six year old tree, at our Lake Huron fruit station, bore six 12-quart baskets of fruit in 1901 ; class, Japanese.

FRUIT : Size $1\frac{3}{4}$ x 2 inches ; form, roundish, narrowing towards the apex ; color, bright red on a yellowish ground with numerous red dots ; stalk, strong, $\frac{3}{4}$ of an inch long, inserted in a narrow, deep cavity ; suture, shallow, distinct ; apex pointed ; pit, oval ; a partial cling.

FLESH : Texture, tender, juicy ; flavor, sweet and delicious.

QUALITY : Dessert, very good ; cooking, very good.

VALUE : Home market, good ; distant market, very good.

SEASON ; August 10th to 20th.

ADAPTATION : The fruit sections of Ontario.



ABUNDANCE.

BURBANK.

The Burbank is one of the best of the Japan plums for the commercial orchard, on account of its beauty, its greatest productiveness, and its excellent shipping quality.

ORIGIN : It was in 1885 that Mr. Luther Burbank of Santa Rosa, California, imported some plum trees from Japan and, when they fruited, he selected this as one of the best and most worthy of propagation. In 1891 he sent samples to the Department of Agriculture at Washington and Mr. H. E. Van Deman, Pomologist of the Department, named it Burbank, after the introducer.

This plum has been before us for ten years and notwithstanding the great number of Japanese varieties now sold by nurserymen, none seems to hold a higher place for commercial purposes, than the Burbank.

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Compared with the Domestica class, the Japanese are inferior in quality, but, when fully ripened, are fairly good eating. Like the Kieffer pear, the Burbank plum is making its reputation rather on quantity than on quality.

TREE : Hardy ; a very vigorous, wayward grower, making a very badly shaped tree, unless severely headed back and kept within bounds ; an early and most abundant bearer ; the fruit needs thinning to secure good size.

FRUIT : One and a half to two inches in diameter ; form, when properly thinned, nearly round, but slightly conical ; skin, orange yellow ground, shaded with red, and almost purple on the side exposed to the sun ; skin, very smooth, with a slight bloom, peels easily when ripe ; suture, traceable ; apex, a small point ; stem half to five-eighths of an inch long, stout ; cavity deep abrupt, with leather-crack marks.

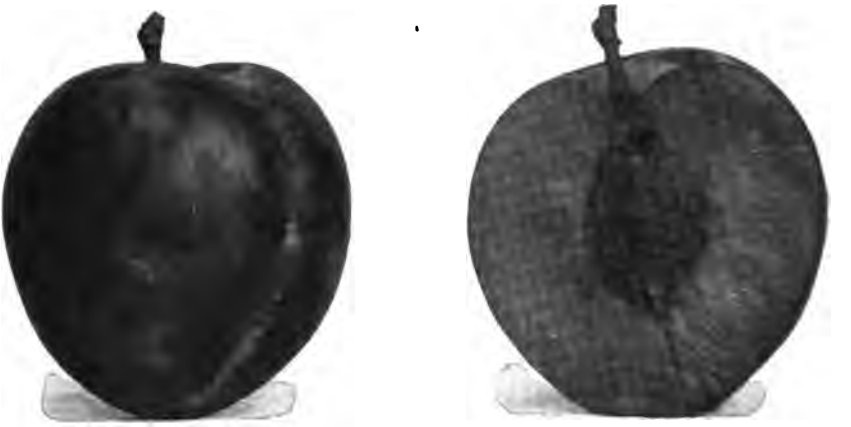
FLESH : Color, amber ; texture, juicy and tender when fully ripe ; flavor sweet, fairly agreeable ; stone, medium, pointed, cling.

QUALITY : Good for cooking ; fair for dessert.

VALUE : First-rate for market.

SEASON : End of August.

ADAPTATION : General.



BURBANK.

BRADSHAW. (DOMESTIC).

(Niagara, Blue Imperial).

Considered by many one of our most valuable European varieties whether for home use or market, because of its fine quality, its large size and beautiful appearance.

TREE : Erect, vigorous, very productive ; class, domestic.

FRUIT : Size, large, 2¼ x 1⅞ inches ; stalk, one inch long, slightly curved ; color, reddish-purple, with blue bloom ; apex, round, slightly depressed ; suture, on one side, broad and shallow.

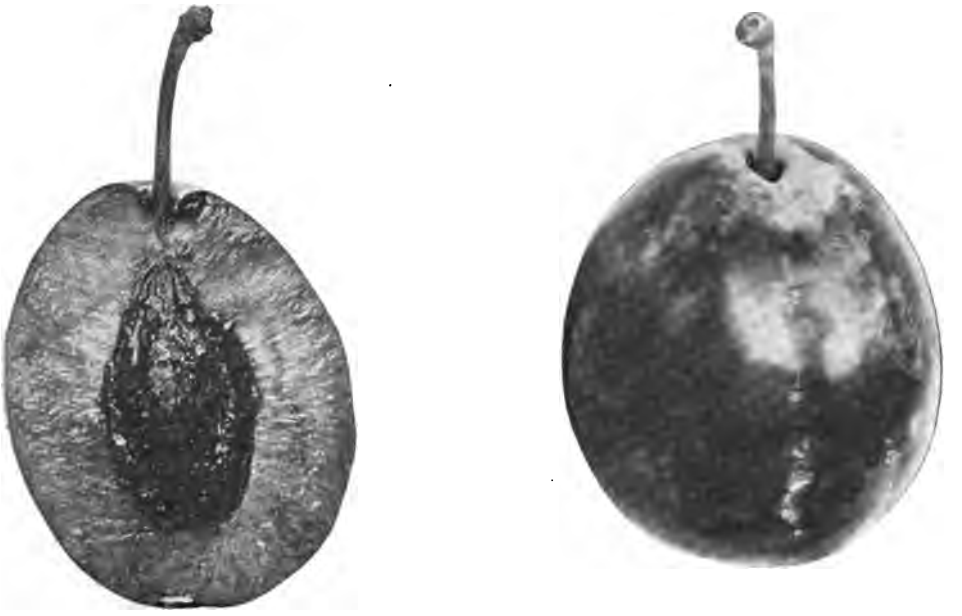
FLESH : Color, yellowish ; texture, juicy, tender ; flavor, rich and sweet ; pit, long, thin oval, partial cling.

QUALITY : Dessert, very good ; cooking, very good.

VALUE : Home market, first-class.

SEASON : August 15th to 30th.

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BRADSHAW.

RED JUNE. (*Red Nagate of Thomas*).

The earliest good plum grown, and one of the most profitable of the Japanese varieties.

ORIGIN : Japan.

TREE : Hardy and vigorous, forming a symmetrical top ; an early and fairly abundant bearer ; class, Japanese.

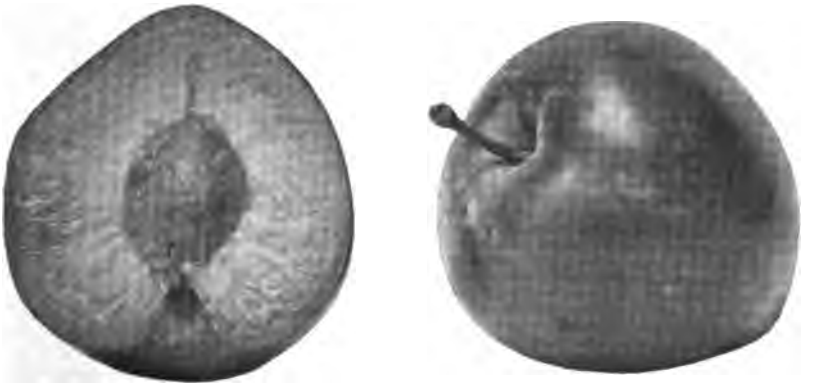
FRUIT : Form, roundish conical ; size, medium, $1\frac{3}{4}$ x $1\frac{3}{4}$ inches ; suture, distinct ; color, dark red, with light bluish bloom ; cling.

FLESH : Color, yellow ; texture, juicy, moderately firm ; flavor, agreeable.

QUALITY : Good.

VALUE : Very good for market.

SEASON : Middle to end of July, (about 1st of August at Georgian Bay station.)



RED JUNE.

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YELLOW EGG.

(White Magnum Bonum).

A profitable commercial variety, on account of its large size and fine appearance, but susceptible to the plum rot and inclined to drop before maturity. Good for canning purposes.

ORIGIN : Europe.

TREE : vigorous, spreading, and very productive.

FRUIT : Size, large to very large, average 2½ by 2 inches ; form, egg shaped with distinct suture on one side ; skin, thick, adherent to flesh ; color, yellow with whitish bloom ; stalk, nearly an inch long, inserted in a small cavity, with a fold about its base ; pit, long, pointed, cling.

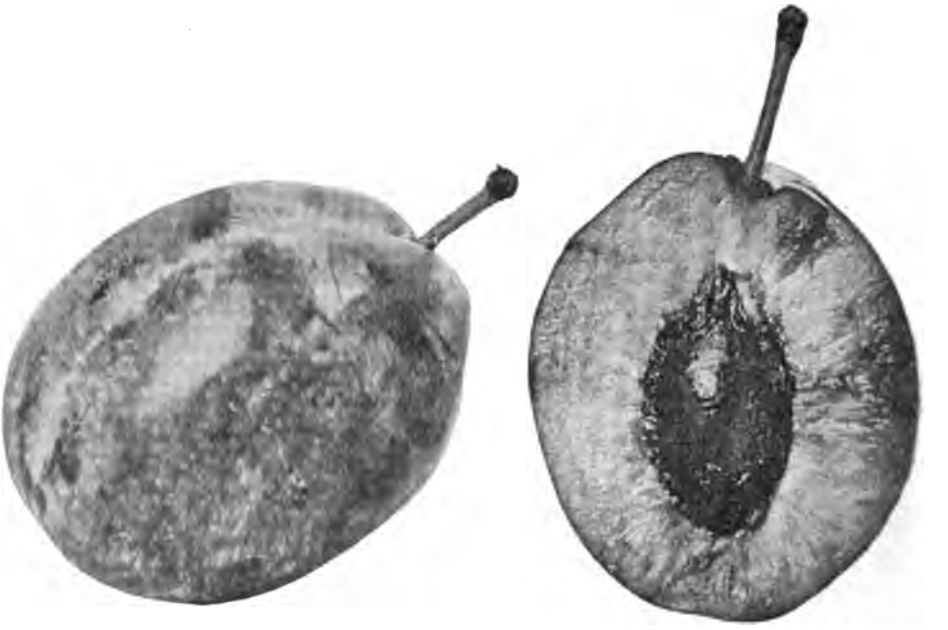
FLESH : Yellow ; texture, firm, juicy, coarse ; flavor, subacid, becoming sweet when very ripe, but ordinary.

QUALITY : dessert, poor ; cooking, good.

VALUE : Home market, very good.

SEASON : End of August.

ADAPTATION : Quite general.



YELLOW EGG.

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STRAWBERRIES UNDER EXPERIMENT.*

CHALLENGE.



CHALLENGE.

Little grown as yet, but promising.

ORIGIN : By J. R. Peck, Breckenridge, Mo., about 1894.

PLANT : Healthy ; a strong grower ; makes runners freely ; blossom, perfect.

BERRY : Large, sometimes cleft at the end ; color, glossy red, quite dark when fully ripe, somewhat resembling old Parker Earle.

QUALITY : Good.

EMPEROR.

ORIGIN : By John Little, of Granton, Ont.

PLANT : Large, vigorous, healthy ; quite productive ; blossom, perfect.

BERRY : Very large, conical, sometimes ribbed ; color, dark red ; flesh, reddish pink almost to the centre ; texture, firm.

QUALITY : Good.

SEASON : Medium to late.



EMPRESS.



EMPEROR.

EMPRESS.

Very like the Emperor and from the same source, originated by the late John Little ; both resemble the Woolverton in fruit. The plant is very healthy, strong, productive and a vigorous grower. The fruit is bright red and attractive, and of good quality ; season, medium to late ; blossom, perfect.

*From Notes taken at Jordan, Ont., by our strawberry expert, Mr. E. B. Stevenson.

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GANDY.



GANDY.

The Gandy originated from the Jersey Queen, fertilized by pollen from Glendale; it is one of the best late varieties.

PLANT: Healthy, strong and fairly vigorous; long runners; makes a good row; free from rust, but rather a shy bearer.

FRUIT: Large and fine, conical in shape, firm, a good shipper; fine dark scarlet in color and a fine looking berry.

FLESH: Pink, firm and fine quality.

ADAPTATION: Does well in most soils, is grown mainly for its lateness.

HALES 11.59 P.M. (*Midnight.*)

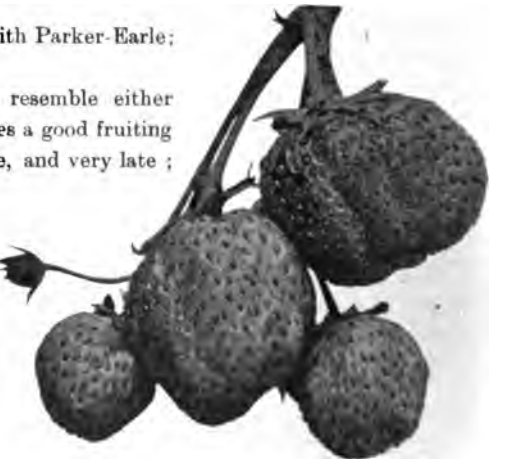
ORIGIN: Seed from Haverland crossed with Parker-Earle; introduced by J. H. Hale, of Connecticut.

PLANT: Strong and healthy, does not resemble either parent; makes plants only sparingly, but makes a good fruiting row; the runners are strong, fairly productive, and very late; blossom, perfect.

FRUIT: The berry is medium in size, flat and conical; color, light, almost white on under side; texture firm; flavor, fine.

FLESH: Pinkish, meaty, good eating.

ADAPTATION: This is a new one, has not been tried over any large area as yet.



HALES 11.59 P.M.



HERO.

HERO.

A very promising variety introduced in 1900. The plant is strong, healthy in the main, a good grower, productive and makes runners freely. Foliage, very dark green. The fruit is a good size and of good quality. It is considered a good one; season early to medium; blossom, perfect.

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HOWARD'S NO. 4.

A seedling originated by Mr. A. B. Howard, of Massachusetts.

The plant is a strong, healthy, good grower, very productive, and of great promise; the berry is large, conical, very regular, bright dark scarlet, very large, and of great beauty. The quality is very good. It has been fruited only once; not yet introduced.



HOWARD'S NO. 4.



KLONDIKE.

KLONDIKE.

Originated in Massachusetts. It is a good, very late variety. The plant is moderate in size, healthy, good grower, making plenty of runners that root easily. The fruit is large, roundish conical, sometimes ribbed, dark red and somewhat glossy; flesh, red, fair quality, medium in firmness. It is quite productive, much more so than Gandy or Hunn; about the same season but not as handsome as the Gandy. It is worthy of trial by those who want a late berry; blossom, perfect.

LATEST.

Originated from seed of Jewell and Belmont by S. H. Wallace, of Massachusetts. The plant is strong, robust, and easy of propagation; it is healthy and free from rust. The fruit resembles the Belmont, conical, sometimes cock's combed; berry, large, dark red, yellow, seeds embedded; flesh, white and firm good quality and productive; the berries lie in heaps around each plant. Season, late as the Gandy, and more productive; a good late variety. This is the first season it has been fruited; it was introduced in 1901, and it has a future before it, especially for those who follow the hill system of cultivation; blossom, imperfect.



LATEST.

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McKINLEY.

McKINLEY.

McKinley is a large healthy plant, fresh looking, a good grower and quite productive. The fruit is large, conical, sometimes with uneven surface, dark red when fully ripe; fine looking, fairly firm and of good quality. Blossoms perfect.

MILLER.

Originated by D. J. Miller, of Central Ohio. The plant is large, strong and vigorous; as large as Bubach, and makes plants very freely; not the slightest trace of rust.

PLANT: Quite productive.

FRUIT; Large, dark, glossy red.

FLESH: Light in color, fruit stems strong and hold the fruit up well among the foliage; quality good; texture, quite firm for so large a berry.

SEASON: Medium to late.



MILLER.

MONITOR.

The Monitor originated from a chance seed in the orchard of L. T. Russell, Missouri, on ground where formerly Crescent and Capt Jack grew. It has some of the qualities of both parents, the productiveness of the Crescent and the vigorous foliage of Capt. Jack.



MONITOR.

PLANT: Vigorous and healthy; foliage, very dark green, glossy. The plant is small and makes almost too many runners; stands dry weather well and is very productive; blossom, perfect.

FRUIT: The berry is large, roundish in form, and bright scarlet. The vigor of the plant seems to be such that it is able to mature and ripen its immense crop, there being no small berries.

FLESH: Firm and good flavor; pinkish inside.

SEASON: Early to late.

ADAPTATION: It seems to do well wherever it has been tried, and taken altogether the Monitor is one of the best that has been introduced for some time; highly recommended to all growers.

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NETTIE.



NEW YORK.

NETTIE.

ORIGIN: One of Black's pedigree seedlings; it is a strong competitor of Hunn for extreme lateness; fruit was picked in the middle of July in 1902.

PLANT: Of medium size; quite healthy and a good runner, making plants freely; fairly productive; blossom imperfect.

FRUIT: Large, ribbed, rough, of quite light color; seeds, dark; flavor, sour, but good; texture, fairly firm.

FLESH: Light colored, almost white.

ADAPTATION: Does fairly well in most places, though we have some unfavorable reports. It seems to need better flavor and greater firmness.

NEW YORK.

A good variety, and very promising.

ORIGIN: In New York State, from seed of Bubach and Jessie; captured a prize of $100 offered by W. F. Allen for any new variety that would produce as large in size and as good quality as Glen Mary.

PLANT: Large, strong, healthy and productive; no rust, makes a fine row; blossom, perfect.

BERRY: Large, conical; a good red, turning to crimson, and colors well.

SEASON: Medium.

ROBBIE.

ORIGIN: One of J. H. Black's pedigree seedlings, from New Jersey.

PLANT: Good grower, perhaps not as large as the Nettie or Joe, but healthy and free from disease: fairly productive; blossom, perfect.

FRUIT: Good size, conical in shape, light red, good flavor, quite pleasant though peculiar to the taste.

FLESH: Salmon colored.

ADAPTATION; Has done fairly well wherever heard from.



ROBBIE.

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FRUIT EXPERIMENT STATIONS.

REPORT OF THE INSPECTOR.

By Prof. H. L. Hutt, Ontario Agricultural College, Guelph.

I have the honor of presenting herewith my ninth annual report of the work of the Fruit Experiment Stations.

The original plan for the establishment of these Stations was unique, and that it has been worked out so successfully must be a matter of gratification to all who had the work in charge. There have been a few drawbacks, such as the loss of most of the trees at the Southwestern Station through the severe winter of 1899, and the removal of Mr. Burrill, the experimenter at the Niagara Station, to British Columbia, but, apart from this, the work on the whole has made great progress. It is doubtful if so much could be accomplished in any other way with so small an annual expenditure.

The extensive variety tests which are being made at these Stations are of inestimable value to the people of the Province, and, in my mind, the most important problem for us now to consider is: How can we bring the results of these tests more prominently before intending planters in every part of the country? The annual report from the stations gives much of this information to those who read, and is valuable at all times for reference; the annual display of fruits from the various Stations, made at the Industrial Exhibition, Toronto, has been a great object lesson, and has helped to bring before the public, in a practical way, the nature of the work being done; but, in our opinion, the results of the tests at the Stations might be brought more prominently before the people throughout the country generally by making use of the opportunity afforded by the county and township fairs. Prize-lists for each fair, revised and improved in accordance with the results obtained at the various Experiment Stations, would have the desired result of bringing out a display of the varieties best suited to the section, and would be looked upon as reliable guides to planters.

Last winter we prepared for the Fall Fairs Association a model prize-list, which might be taken as a guide in preparing such lists adapted to the various sections where the fairs were held. This list will be sent to the secretary of every fall fair in the Province, and I trust will be useful in still further applying the results of the Station tests.

The whole session, which is to be given to the work of the Fruit Experiment Stations at the next meeting of the Ontario Fruit Growers' Association, should also help to bring before the public some of the valuable results already obtained at the Stations.

In speaking of the work of the stations in this report, I have mentioned each in the order in which it was visited, and these visits were arranged, as far as possible, to enable me to see to the best advantage the fruits being specially tested at each station.

The Lake Huron Station. Experimenter, A. E. Sherrington, Walkerton.

Visited July 24th. At the time of my visit Mr. Sherrington was busy harvesting his bush fruits—raspberries, currants, and gooseberries—of which he had an abundant crop of good quality.

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The trees in his young experimental plum orchard were again heavily loaded this year, notwithstanding they yielded a heavy crop last year. A number of Japan varieties have been doing particularly well at this station. Abundance and Burbank trees, six years planted, produced nine or ten baskets of fruit each last year, and the trees are thrifty and healthy this year, and again have some ripe fruit upon them. The Satsuma, another Japan variety having a blood-red flesh, was very heavily loaded this year. Mr. Sherrington says this variety has been in great demand for canning purposes.

There are a number of varieties of cherries under test at this station. Three trees of Ostheim were still heavily loaded at the time of my visit, and were particularly fine. The cherry crop as a whole, however, was not up to the average this year. Most of it was taken by the birds, the robin and the Bohemian waxwing being the chief offenders. The protection of this crop from these birds is becoming a serious problem with cherry growers, and Mr. Sherrington, like many others, was compelled to resort to the shot-gun as being more effective than Mr. Powell's plan of growing an extra crop for the special use of the birds.

The experimental apple and pear trees planted a few years ago have made good progress, and some are beginning to bear.

The apple crop in the older orchard was particularly promising, the fruit being exceptionally clear of codling moths, although the apple scab had made its appearance in spite of repeated sprayings of the Bordeaux mixture. From his orchard of five acres, Mr. Sherrington sold last year 200 barrels, which netted him about $500.



Experimental plum orchard at John Mitchell's, Clarksburg. Trees four years planted. Intercropped with sugar beets.

Mr. Sherrington's place is a good example of "a little farm well tilled." He has only ten acres, but from this little plot he netted last year nearly $800. Such profits, of course, mean careful attention to details, both in growing and marketing, and Mr. Sherrington succeeded in developing a good market for nearly all his products right at home.

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Mr. Sherrington is also a reliable and careful experimenter, and his annual reports are of much value to the growers of his section

THE GEORGIAN BAY STATION. EXPERIMENTER, JOHN MITCHELL, CLARKSBURG.

Visited August 4th. Prof. Lochhead, of the Ontario Agricultural College, accompanied me to this station this year, and in our opinion the sight in Mr. Mitchell's experimental plum orchard was well worth seeing.

The young orchard, where the trees do not yet require all the space, was being inter-cropped with sugar beets, but the older orchard, where the trees require all the space, was under clean cultivation, and was just ready for seeding down to the fall cover crop.

All trees have been carefully pruned and sprayed, and most of them were bearing a good crop. The fruit promised to be above the average in quality, due in part to the favorable season, but more to the good care given, and also to the fact that the trees were not overloaded.

Mr. Mitchell has now over 170 varieties of plums under test, and here, as well as at the Lake Huron Station, one of the most interesting features of the work has been the success of the Japan varieties. When these were first introduced, a few years ago, it was supposed that they would be too tender for any except the southern portions of the Province; but at every station where they have been tried, not even excepting the Algoma station, they have proven hardy and productive. Of the many varieties of this class under test, Mr. Mitchell has found the Red June, Chabot, Burbank, and Abundance among the best.



Experimental plum orchard at John Mitchell's, Clarksburg, showing clean cultivation, ready for cover crop. Trees eight years planted.

The American, or native plum, of which there are now a large number of varieties under cultivation, Mr. Mitchell considers are hardly worthy of a place in the orchards in this section, when the European and Japan varieties suited so well, and as fast as these varieties are tried and found want-

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ing, he is top-grafting them with the best European sorts. This tends to show how doctors differ, for by some growers the best of the Americana plums are much preferred to the best of the Japanese or even European varieties.

In the bearing apple orchard, there was promise of a good crop of fruit of most varieties, although there had been a great deal of late falling of the small fruit, due to the unusual, cool, wet weather.

In the apple orchard the same clean, level cultivation had been given as was given to the plum orchards, and the ground had just lately been seeded to crimson clover.

Another interesting feature of the station has been the test with eight varieties of peaches. There are three trees of each variety, and all of them looked thrifty, and were well loaded. From these same trees Mr. Mitchell sold last year about 30 baskets of fruit.

The results attained at this station during the past five years have well repaid for the small outlay put upon it, and the careful report sent in each year by Mr. Mitchell is of untold value to plum growers all over the country.

THE SIMCOE STATION. EXPERIMENTER, G. C. CASTON, CRAIGHURST.

Visited August 6th. There had been continued rain in this section almost all summer, and the small-fruit crop, although much later in ripening, was excellent. At the time of my visit, the Cuthbert raspberries were at their best, and, notwithstanding the fact that it freezes back more or less severely every winter, this variety has proved to be the best of its kind for this section.

One of the surprising results of the work at this station has been the fine crops of blackberries that have been produced year after year. Blackberries, as a rule, have been thought too tender for any but the most favored fruit-growing districts, but Agawam and Eldorado have proved quite hardy here, and both were carrying a fine crop of fruit.



Mr. G. C. Caston's Duchess apple trees, 15 years planted, propped to support their loads.

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The cherries this year had not done so well as last, and Mr. Caston is having a hard fight to keep them free from the black knot, which comes in from neighboring trees. Many of the trees were badly defoliated by a blight, which might have been prevented by spraying with the Bordeaux mixture, but thorough spraying was almost impossible this year because of the excessive rains.

Plums were a light crop at this station. Several apricot trees were well loaded, but the curculios, which were unusually abundant, had destroyed most of the fruit.

One of the finest sights at Mr. Caston's this year was the great crop of Duchess apples. Every tree was so loaded that propping was necessary, and the fruit was of the finest quality. This is certainly one of the most valuable varieties for northern sections, where it ranks as an autumn rather than a summer variety.

On the winter varieties of apples there had been a good show of fruit early in the season, but, on account of the cold, wet weather, it had been falling steadily all through June and July, until but a light crop was left.

This station is situated too far inland to be influenced by the waters of Lake Simcoe or the Georgian Bay; hence, whatever proves hardy here would likely be so over a large part of the Province. The reports of tests here during the past nine years have given valuable information regarding the hardiest and best varieties of apples, pears, plums, cherries and small fruits for this and similarly situated sections.



Among the Cuthbert raspberries at G. C. Caston's, Craighurst.

THE SOUTHWESTERN STATION. EXPERIMENTER, W. W. HILBORN, LEAMINGTON.

Visited August 28th. All of this southwestern peninsula suffered terribly by the "freeze" of February, 1899. Thousands of peach and other tender fruit trees, in orchards ranging from 10 to 100 acres in extent, were at that time destroyed. Peach-growing then received a blow from which it has not yet fully recovered. Quite naturally, some growers became discouraged, and

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did not replant, but most of them, however, have been replanting steadily ever since, and some of the early planted of these are now coming into bearing.

In orchards where a few trees survived the freezing, the spaces were filled in with young trees; but this has made the orchards very uneven in appearance, especially as the old trees here and there have been dying out since, necessitating replanting. This has been the case in Mr. Hilborn's experimental orchard, which, naturally, has been very discouraging to him, after having had such a fine orchard and large collection of varieties in bearing to report upon.



View of Mr. Hilborn's peach orchard. Trees 16 months from date of planting.

On another farm near the lake shore, his brother, Mr. J. L. Hilborn, has twenty acres of young peach trees planted since the freezing, which are just coming into bearing, and make one of the finest orchards to be seen in the section.

Many of the young peach trees planted in this section during the last few years have made very unsatisfactory growth, and whole orchards have proved to be an entire failure. It was at first supposed that the trees were being injured by the fumigation to which they were subjected before they left the nursery, but it has since been found out that the trouble was due to root aphids, which, evidently, were not destroyed by the fumigation. Mr.



Mr. J. L. Hilborn's 20 acre peach orchard. Two year old trees.

Hilborn has found that the best way to rid the roots of these insects is to dip the roots of the young trees, before they are planted, in strong tobacco water. The tobacco water is made by steeping tobacco stems in water in the proportion of 3-4 of a pound of stems to one gallon of water. Trees treated with this decoction have made excellent growth, while untreated trees adjoining them have proved an entire failure.

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The peach crop in the Essex peninsula this year was excellent, and Mr. Hilborn had fruiting quite a number of varieties upon which he will be able to report.

Plums were a light crop, probably on account of the heavy crop last year. The Japan varieties are proving of great value here as well as elsewhere, and they appear to be much less susceptible to the shot-hole fungus than the European varieties.

THE BURLINGTON STATION. EXPERIMENTER, A. W. PEART, BURLINGTON.

Visited August 28th. The Burlington district has long been known as an important fruit section, and in no other section that I know have the growers worked together so unitedly for their common interests. This co-operation, among the growers, has helped to win for this section high awards at all the recent large expositions, such as were held at Chicago, Paris, Glasgow, and Buffalo, as well as the first prize for ten years in succession at the Toronto Industrial, for district exhibition.

The growers of this section were also the pioneers in the use of the bushel and half-bushel box instead of the barrel for the shipment of apples and pears to the Old Country, and by the continued use of these boxes for the shipment of good fruit they have succeeded in establishing a good demand for their fruit in the British market.

Mr. Peart, our experimenter, has not confined his attention to any special line of fruits, but he has an extensive collection of both the large and small fruits.



Wordens in the vineyard of A. W. Peart, Burlington.

At the time of my visit he was busy picking and packing his Blenheim and Ribston apples for the Montreal and European markets, all of the fruit being packed in the bushel boxes.

The apple crop in this section was not above the average this year, but the quality of most kinds was good. The scions of about thirty varieties

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of apples which were grafted on bearing trees a year ago last spring, have made good growth, and some of them began fruiting this year.

Pears were a light crop, this being their off year.

Plums, also, were a light crop because of the heavy one last year.

Grapes, blackberries, and currants all bore heavily, and will be fully reported upon in Mr. Peart's annual report.

Mr. Peart is a thorough cultivator and a careful experimenter, and the reliability of his reports make them of much value to the growers of that section.

THE WENTWORTH STATION. EXPERIMENTER, M. PETTIT, WINONA.

Visited September 6th. My visit to Mr. Pettit's this year was timed so that I might help him gather his samples of grapes for the Toronto Exhibition, and thus have an opportunity of carefully going over with him the many varieties in his experimental vineyards, but, owing to the unusually cold and backward season the grapes this year were very late in ripening, and at the time of my visit very few, except Champion, were showing signs of taking on color.



Grape rows half a mile long in Murray Pettit's vineyard, Winona.

The grape crop, besides being so late in ripening, was hardly up to the average at Winona this year.

As mentioned in my last report, there are but few among the many varieties of grapes being tested in the new experimental vineyard that are worthy of further cultivation. Many of them are not only worthless, as far as the fruit is concerned, but the vines are also so unthrifty looking that they would not be worth grafting upon. Mr. Pettit intends to replace the unthrifty ones as soon as possible with new vines of the best sorts, and graft the thrifty ones with some of the old standard kinds, such as Agawam, Lindley, and Wilder.

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The experimental plum trees planted out shortly after the station was established, have been fruiting for the past two or three years, but the crop this year was rather light upon most varieties.

Mr. Pettit and I went carefully over all the trees, and as far as possible verified the names of varieties, many of them having come wrongly named.

Mr. Pettit has a large orchard of pears, and the crop this year of Giffard, Bartlett, Duchess, and Flemish Beauty was exceptionally fine. The Keiffer pear orchard at this station, planted nine years ago, is a model one. The trees are uniformly thrifty and have been fruiting heavily for several years. Last year from this orchard of 1,500 trees Mr. Pettit shipped three car-loads of fine fruit.



How the Ontario apple yields at Trenton. A six year old tree at W. H. Dempsey's, Trenton.

Most of Mr. Pettit's orchards and vineyards are on heavy red clayey soil, which requires careful management to get the best results; but the crops raised on it show that, with good management, it excels the light soils for productiveness. The plan Mr. Pettit adopts is to give clean, thorough cultivation during the early part of the season, and follow this after July with a cover crop of rape and rye. The rape is sown in the alternate rows as soon as cultivation ceases, and the rye is not sown till the fruit is harvested, and therefore does not interfere at all with the harvesting. The next year the rape is sown in the rows where the rye was grown the year before, so that he has an alternation of cover crops.

THE GRIMSBY STATION. EXPERIMENTER, L. WOOLVERTON, GRIMSBY.

Visited July 5th and Sept. 6th. A meeting of the Board of Control was held at Mr. Woolverton's place on July 5th, at which time his experimental cherry orchard was showing an abundance of fruit The trees in this young

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orchard are all now nicely in bearing, and the collection of varieties is a most interesting one. In the July number of the Canadian Horticulturist, as well as in his annual reports, Mr. Woolverton has already given valuable notes on the varieties which he has found most satisfactory.

Upon my return to the Grimsby section in September, I again visited Mr. Woolverton, and found all hands busy putting up a car-load of Bartlett pears for the Glasgow market. The Pettit fruit grader was being used for grading the fruit into the various sizes. Each pear was wrapped in tissue paper, and it was all being carefully packed with excelsior in small crates, something similar to those used in the shipment of the California pears.

Mr. Woolverton deserves great credit for the persistent effort he has made for several years past to establish a demand in the old country markets for the more tender class of fruits, with which our large markets are so often glutted, and the successful shipments made this year warrant us in believing that before long we will have in the old country an unlimited market for all of our well-grown and carefully packed fruits.

THE EAST CENTRAL STATION. EXPERIMENTER, R. L. HUGGARD, WHITBY.

Visited September 24th. The trees in the old bearing orchard at this station have been rather too closely planted, and are now becoming much crowded There was a fair crop of fruit this year, but it had become badly spotted with apple scab. The past season has been a difficult one in which to do thorough spraying, because of the excessive rains.

The trees in the young orchard, planted five or six years ago, have been well cared for, and have made good growth. Quite a number of them were fruiting this year, and Mr. Huggard has taken note of this and will speak of them particularly in his annual report this year.

THE ST. LAWRENCE STATION. EXPERIMENTER, HAROLD JONES, MAITLAND.

Visited October 4th. This is the first year I have had the opportunity of visiting this section of the country late enough in the season to see the Fameuse and Scarlet Pippins in their full color. These beautiful apples seem to reach perfection in Mr. Jones' orchard. One of his bearing orchards of about five acres is made up mostly of these two varieties, and the regularity of the crop in this orchard is something remarkable. The crop this year was as usual about 700 barrels. The regularity of crop may be accounted for to some extent, however, by the careful attention given in the way of cultivation, pruning and spraying.

In the young experimental orchard, most of the trees have made good growth, but the varieties too tender for this section are plainly beginning to show themselves.

One of the new promising apples in this young orchard is the Milwaukee. The trees are thrifty and begin bearing early, and the fruit is of good size and fair quality.

Among the pears under test, there are a few which have made good growth and have begun bearing, but the majority of them appear to be too tender for this section. The same might be said of many of the European plums, but those of native origin stand out prominently for their extreme hardiness and vigor. Several varieties of them bore heavily this year, and will be noted in Mr. Jones' report.

Within the past two years, Mr. Jones has planted out several acres more of apple trees, mostly of the McMahon White, which he considers one of the hardiest and healthiest for a stock upon which to graft the more saleable kinds.

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THE BAY OF QUINTE STATION. EXPERIMENTER, W. H. DEMPSEY, TRENTON.

Visited October 7th. This station is in the centre of one of the finest apple-growing sections in the Province. For the last two years, it has been my good fortune to arrive here just in time to attend the Wooler Township Fair, and I think I can safely say that I have never seen finer samples of apples shown anywhere than are at that little Township Fair.

Mr. Dempsey's orchard is a remarkable one in several particulars,—first because of its size; second, because of the great number of varieties it contains; and third, because of the regularity of the crop. Last year, when apples were a failure in most parts of the country, Mr. Dempsey had about 1,800 barrels. This year his crop will probably be about 2,500 barrels. There are about 300 varieties of apples in bearing, many of these being grown simply as top grafts for testing. The varieties making up the greater part of the crop, however, are: Ontario, Northern Spy, Ben Davis, King, and Fameuse.

The fruit is put in barrels as picked, and is hauled at once to the fruit-house, where it is repacked, and shipped during the fall and winter, when it can be sold to the best advantage. Mr. Dempsey's skill, not only in growing, but in handling and marketing his crop, has made him one of the most successful apple growers in the country.

The trees in the young experimental orchard have made good growth, and most of them are just coming into bearing. Among them are an interesting lot of new varieties. These will be described and reported upon in Mr. Dempsey's report.

Mr. Dempsey has very kindly furnished me for the past two seasons with samples of nearly a hundred varieties of apples for study and class use at the College, for which I am greatly indebted. Careful descriptive notes have been taken of all of these, which will be useful in verifying varieties.

STATIONS NOT VISITED.

On account of the difficulty of getting away from the College during the month of June, when we have excursions visiting us every day, and also because of extra work in looking after our own small-fruit tests at that time, I was unable to get to see Mr. Stevenson's strawberry plantation at Jordan, but I had the pleasure of comparing notes with him in our plantations at Guelph.

The "Pioneer Farm" at Dryden also was not visited this year, but as most of the new stock was sent there only a couple of years ago, it could not have got more than nicely started by this time.

REPORT OF VISITS OF INSPECTION MADE BY MR. A. M. SMITH OF ST. CATHARINES.

In accordance with your wish, I visited in the first week of August the stations at St. Joseph's Island and Craighurst; and also the station started by myself on the farm of W. F. Clark, Powassan, and would report as follows:

ALGOMA STATION.

The station at St. Joseph's Island I found in a very satisfactory condition, and nearly all the varieties of fruit planted growing fairly well, with the exception of a few killed by mice during the past winter, and two or three

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cherry trees which had failed to leaf out for some unaccountable reason, though others of same variety near them were doing well. Several varieties of plums, to my surprise were well loaded with fruit, among them Lombard and Burbank; also several cherry trees. Grapes came nearest to failure of any fruit tried here. Mr. Young is a thorough and painstaking cultivator and will doubtless give you a full report of this station.

Simcoe Station.

At this station, which is in charge of Mr. G. C. Caston, of Craighurst, I met Prof. Hutt, who had gone over the grounds before I arrived, and who will doubtless report on them. I found the trees well cared for here and everything arranged in a systematic manner. The many varieties—especially of pears—were in fruiting, which I did not expect to find so far north. The most serious trouble I saw was some kind of a fungus which had destroyed the leaves on several varieties of cherries, leaving the fruit hanging on the tree, immature and worthless.

I also visited the grounds of Mr. Stephens, our Director at Orillia, and saw several varieties of seedling gooseberries which were very fine, and I think would be well worthy of cultivation. He has sent specimens to our "New Fruits" Committee.

Powassan Station.

In regard to the station at Powassan I suppose it will be well to give you a little history of it. While visiting there in 1898, I learned that repeated attempts had been made to grow fruit there without success, as nearly every thing planted was killed by the severe winters, and the people had become discouraged and seemed to think that fruit could not be grown. I told my friend, W. F. Clark, with whom I was stopping, and who owns a large farm there, that I believed I could send him varieties that would succeed, and as I was then engaged in the nursery business I thought it might prove a good advertisement if a success. I told him I would furnish him a lot of trees if he would plant and test them, and report his success with them, which he consented to do. Accordingly in spring of 1899 I sent him a lot, and again in 1900; there were about 100 trees in all, consisting of from two to five of the following varieties :

Apples. Duchess, Princess Louise, Wolf River, Scott's Winter, Mann, Golden Russet, Yellow Transparent, Longfield, Gideon, Wealthy, and several varieties crab.

Pears. Bessemianka, Clapp's Favorite, Idaho, Goodale.

Cherries. Reine Hortense, Riga No. 18, Ostheim, Baba, Early Richmond, Montmorency.

Plums. Wolf, de Soto, Stoddard, Hawkeye, Moore's Artic, Willard, besides gooseberries and currants, etc.

I found the trees had been fairly well cared for, being planted in a garden plot, but only about one-third of them were living and not all of these gave promise of success. None of them had yet borne fruit, except a few of the crab apples. Most of the cherries were thrifty and healthy. The following is a list of the surviving trees :

Apples. 4 Crab apples, Whitney No. 20 and Hyslop, 4 Duchess, 3 Yellow Transparent, 3 Scott's Winter, 1 Gideon, 2 Mann.

Cherries. 4 Riga No. 18, 2 Ostheim, 2 Richmond, 3 Montmorenci, 2 Reine Hortense.

Plums. 2 Moore's Artic, 1 Willard, 2 Wolf, 1 de Soto.

Pears. 1 Bessemianka, 1 Goodale.

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In view of the partial success of this experiment, I think it would be well for the Government or Board to take it up, and continue it, as there is a large district here subject to the same climatic influences in which there is little or no fruit at present grown.

Mr. Clark says that if the Board will see fit to furnish the trees, he will replant those that have died out of this plot next spring, and if they want to enlarge he will prepare a new field which he is clearing next summer in what I consider a very favorable locality, and plant there under your direction. I will relinquish all the claim I have for the good of the country, believing it would be a great boon to that section of the country to test and find some fruits that would grow there. All of which is respectfully submitted.

REPORT ON TENDER FRUITS.

By L. Woolverton, Grimsby.

In the pursuance of an extended study of the adaptation of our fruits to various sections of Ontario, we are surprised to find how many fruits, hitherto considered too tender, may be successfully grown in certain favored sections; and this discovery may help to advance the interests of our fruit growers. On the other hand we are disappointed when we find that some most desirable fruits cannot be cultivated with any certainty, and hence must be finally discarded. The publication of this information should prevent the useless waste of money in the farther planting of such varieties. The following fruits are presented in order of ripening.

Apricots. Among the unprofitable fruits in Ontario we are inclined to place the apricot, which is so successfully grown in England and also in California.

About twelve years ago I planted one dozen Russian apricots, upon the commendation of the nurserymen. During all these years I have sought vainly for ripe fruit, but have been disappointed. The bloom opened so early in spring that it was sure to be touched with frost and drop either in bloom, or while the fruit was still small and green.

In 1895 I planted eleven named varieties, viz:—Harris, Shense, Nicholas. Gibb, Red Masculine, Kaisha, Alexander, Skobeloff, Montgamet, Early Golden, and Peach. I took the best of care of them, and two years ago had two or three samples of Early Golden, but otherwise the trees have yielded no fruit, and many of them are now in a dying condition. Another special weakness of the apricot is its liability to the curculio, which causes the young fruit to drop before maturity.

Nuts.

Cobnuts. About ten years ago, I procured a quart of Kentish Cobnuts from Pelee Island, hoping we might grow them profitably in the Niagara District. The trees have grown most vigorously, but most persistently fail to produce any nuts, with this exception that two years ago I had a single specimen. From my experience with them so far, I am inclined to condemn them as unprofitable.

English Walnuts. For many years there grew not far from my house, a large seedling tree of this nut, but though the tree lived to quite an age, it seldom bore a crop of fruit, and seemed to be almost as tender as a peach. But a friend near by has a tree which seems to have exceptional hardiness, and deserves careful study. At the age of eight years it bore its first crop of nuts, and has increased in productiveness ever since, until now at the age of

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fifteen years a crop has just been harvested of about six bushels, and sold for about fifteen dollars. We have planted six pounds of nuts, and hope for some good results.

PEACHES.

It is now about forty years since the first commercial peach orchard of any consequence was planted in Ontario. It was five acres in extent, and was planted on the grounds of your Secretary.

Among the varieties planted, the earliest was Early Purple, a variety little planted nowadays, but at that time the earliest to ripen, and very agreeable in flavor. It was too tender for distant shipment, and very often a large part of the crop was wasted because it softened too quickly to be handled for market. It ripened about the 2nd of August, and was followed by the

Early Crawford, which term "early" is a misnomer, for we have varieties now which ripen more than a month in advance of this variety. This variety is somewhat tender in bud, and does not produce a full crop as often as some other varieties; yet after fifty years of trial the beauty of the fruit, its large size and excellent quality, retain for it the first place as a market peach. No variety is so much called for in our markets, and no variety more remunerative to the grower who gives it proper care. It needs very rich soil, close pruning and most careful handling to get the best results.

Old Mixon Free. Following the Early Crawford was another very excellent variety, but one that also is a little tender, the Old Mixon Free, a medium sized, white fleshed peach, of delicious quality. This peach succeeds well in all peach sections, and why it is so little grown at the present time, I cannot understand. Certainly it should have a place in the home garden.

Smock. The Smock is another variety that has now had forty years testing at Maplehurst, and still holds its place among the best commercial varieties. It is yellow in flesh, and about the last peach to ripen, being usually ready for market during the first week in October. It is not very juicy, and therefore an excellent shipper, and highly esteemed for drying.

Other Kinds. There are quite a number of other varieties that were thoroughly tested in this old orchard, which are now little grown, such as Stump the World, The Sweetwater, Royal George, Early York, Morris White, Barnard, Crawford's late, Jacques' Rareripe, Old Mixon Cling, etc., which have not proved of sufficient value for general planting.

NEWER VARIETIES.

For some years it has been the tendency to seek for very early ripening varieties, and among them we have tested a good many which are not worth recommending, as for example, Amsden's June, Early Louise, Early Canada, Hyne's Surprise, etc. Among those which have so far given good promise, we report upon the following:

Sneed. A variety originating in Tennessee, from seed of Chinese Cling. Its great value is its earliness, the first ripe being picked on the 20th of July in 1902. Like most of the early peaches, it is a clingstone, and only of fair quality, but in my opinion it is a little better than Alexander. The flesh is white, and the size of the fruit medium, averaging about two inches in diameter.

Greensboro. In my opinion the Greensboro is the best very early peach grown in Canada, for the table. It is larger and finer looking than the old Early Purple, of which its white tender juicy flesh and sweet flavor reminds me. The size averages about 2 1-4 inches. It does not seem to be subject to rot, and the tree is very productive. Last summer my trees were breaking

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down with their load of fruit. The chief fault is its tender flesh which makes it difficult to handle, as in the case of the Early Rivers. It begins to ripen about August 1st.

Triumph. Though a prolific bearer, yellowish in flesh and freer from rot than its parent, the Alexander, the Triumph does not equal the claims of its introducers. The tree is subject to blight which spreads rapidly and affects the fruit itself just previous to maturity, and its thick furry skin is not attractive to buyers. If not thinned, the fruit is inclined to be small in size. Its season is early in August.

Alexander. Perhaps no early peach has been more widely planted than the Alexander, and the last year or two has proved that this is a great mistake; for our markets have been glutted with the fruit until it has become almost unsalable. One serious fault is its great susceptibility to rot, and another that it puts on an attractive outside, which disappoints the buyer when he finds the flesh too firm to be good eating. This peach has been much overplanted in Ontario.

Hale's Early. The Hale's Early is another peach with the same fault as the Alexander; the flesh is too firm for eating, or to be cut up for the table, and it often rots just as it matures. Previous to the introduction of the Alexander it was the chief early variety, but it cannot be recommended for general planting. Season 15th to 30th of August.

Early Rivers. The Rivers is a fine white fleshed peach of good size, and agreeable flavor, which ripens about the middle of August. It is widely planted for market purposes in Ontario, but is less popular than it was, because of its tender flesh. When well thinned it can be grown to a fine size and color, but it must be handled with great care, for the slightest bruise turns black and spoils its sale.

Yellow St. John. In the Yellow St. John we have the earliest, really first-class peach grown in Ontario, and one which so far has not been over planted. It is a good sized peach, averaging about 2 1-2 inches in diameter: it has a yellow skin and a fine red cheek; the stone is free, and the flesh yellow, melting, juicy and agreeable. It is desirable for all purposes, and its season is just over as that of the Early Crawford begins. Last season at Maplehurst its season was from August 25th to September 5th.

Elberta. There is perhaps no peach of recent introduction which possesses so much merit as the Elberta. Its season is the last of September, when it has no rival in yellow fleshed peaches, and, if well grown, it is large and attractive in appearance. Though not of highest quality for dessert, it is a good all round variety. One great point in its favor is its shipping quality, in which respect it is not surpassed by any peach we have grown. The trees at Maplehurst have proved themselves vigorous and productive.

Steven's Rareripe. In the Steven's Rareripe we have another peach which is almost the equal of the Elberta for shipping purposes. It is large in size, averaging nearly three inches in diameter, while in flesh it is tender, juicy and of good quality. Its season is the first week in October, just a trifle in advance of Smock. We tried exporting this peach both in 1901 and in 1902 to Great Britain, with the most encouraging results. Half bushel boxes sold from 4 shillings to 6 shillings each.

Early Michigan. The Early Michigan is in our opinion more desirable than Hone's Surprise, Alexander or Waterloo, being less of a cling, and more tender in flesh. It ripened in the Niagara District about the middle of August, in 1902.

Other Kinds. We have under test about one hundred varieties and among them several that should be named as very desirable for general planting, as for example, Fitzgerald, Engol, Champion, Longhurst, Salway, Crosby.

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Reeves, Millionaire, Kalamazoo, Garfield, etc., etc., upon which we will reserve our report for another season.

Tender Cherries.

While the Kentish and Morello cherries are hardy, and may be grown in almost any fruit section in Ontario, the Hearts are much more tender, and many of them cannot be successfully grown outside the peach belt.

Even in the Niagara District Heart cherries are occasionally nipped in the bud by severe winters. Still, wherever the peach succeeds we would recommend the planting of the following varieties which we have tested and proved profitable in the Niagara district:

Governor Wood. The best early dessert cherry, light yellow in color and richly shaded with light and dark red. The flavor is sweet and delicious and it is in season about the middle of June.

Knight's Early Black. The earliest fine black Oxheart coming in about the beginning of July. The tree is a regular and even bearer, and the fruit is very little disturbed by bird, and not subject to rot.

Black Tartarian. The best main crop black Heart cherry. The fruit is very large, tender in flesh, and delicious in flavor. Its fault is that it ripens rather unevenly and is very subject to ravages by birds. In dry seasons I find it very susceptible to rot. Season, the end of June.

Napoleon Bigarreau. This is the largest of the sweet cherries, and is one of the most profitable for market. The tree is enormously productive, and if the fruit could hang till ripe and fully colored it would be the best market cherry on our list. This, however, it cannot always do, for in wet seasons no cherry is more susceptible to rot, and sometimes nearly the whole crop of Napoleons is destroyed by it.

Yellow Spanish. In this cherry we have one of a little higher quality than Napoleon; the flesh is yellowish, and the skin yellowish white, with a bright red cheek. The tree grows to an enormous size, and sets a prodigious quantity of fruit, the most of which blight and drops before ripening, consequently this variety may be called unproductive. Season about the middle of July.

Mezel. One of the finest of the black cherries, in season about the middle of July. It is a firm fleshed cherry, of the Bigarreau class, and not a Heart, though at first sight it might be mistaken for Black Tartarian. The fruit is very large, almost black, and first class in value for any purpose.

Elkhorn. The most profitable late black cherry we have tried at Maplehurst. Its season is the last half of July. The fruit is nearly black, quite firm and an excellent shipper. In wet seasons we have found it subject to rot, in dry seasons we have harvested immense crops off trees of this variety.

Windsor. A variety of Canadian origin, and on clay soil very productive of fine large, dark cherries; but with us, on sandy loam, much subject to rot, and too much inclined to make wood rather than fruit. Its season is about the same as Elkhorn.

Plums.

The European Plums. For excellence of quality no class of plums can be compared to the European or Domestica class. For hundreds of years these plums have grown and been improved under special cultivation and selection by the gardeners of Europe and Asia, and where these succeed as they do in the southern parts of this Province, there is no reason why they should not be planted freely for commercial purposes. For convenience sake they have been divided into several sub-classes, as for example: (1) The Gages, roundish plums, green or yellow in color, with green flesh, including Reine

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Claude, Green and Imperial Gage, Washington and General Hand; (2) the prunes, oval plums, blue purple in color and rather firm, greenish yellow flesh, including the German Prunes and Prune d'Agen; (3) the blue plums with large oval fruit, dark blue in color, with firm yellow flesh, including such varieties as Kingston, Quackenbos, Shipper and Arctic; and (4) the Red plums, of which the fruit is obovate, purplish, with thin skin and soft, juicy flesh, as Bradshaw, Victoria, Pond, Duane, and Lombard.

Of course the above distinctions are more or less arbitrary, for, in these days of cross breeding, classes are being more and more obliterated, and individuality alone seems to remain for study. For the home garden a large assortment of these plums is most interesting and desirable: for the commercial orchard it is best to make the list as limited as possible, and to plant only three or four of the very best varieties. The time to decide upon what varieties are most profitable for one to grow is in plum season, when the fruit is being harvested and sold.

Too Many Varieties Grown. It is an old saying that you should not put all your eggs in one basket, for an accident might cause the loss of all, and no doubt this applies to plums as well as to eggs; and yet the more common mistake is the planting of too many varieties. Not knowing anything about them, the young planter is guided almost entirely by the agent or by the nurseryman's catalogue, from which it would seem desirable to plant the whole of the list, for all of them are lauded most highly. Just here the work of our fruit stations comes in, to determine the varieties best suited to each section for home use and for markets, and the reports from the experimenters will prove more valuable each year.

Picking and Marketing. Plums need to be handled a little on the green side, especially the "Red Plums", such as Bradshaw, which quickly becomes too ripe to ship, and indeed they cannot well be sent to very distant markets. The Prunes are much better shippers, and this class of plums is being forwarded by the steamer from Collingwood for distribution to towns on the north shore of Lake Huron, and points farther west.

Plums in Ontario have usually been packed in a basket containing eleven quarts, but since new sizes have been introduced this basket will be discarded for the one holding twelve imperial quarts, which is rather large for plums. A very suitable standard sized basket for choice plums is the 6 2-3 quarts basket, which also holds about nine pounds, and will soon become a favorite basket for all kinds of choice tender fruit for our markets.

GENERAL NOTES BY EXPERIMENTERS.

Burlington Fruit Station.

The following classes of fruits are under cultivation here: Currants, 22 varieties; blackberries, 22; pears, 44; plums, 50; grapes, 28; raspberries, 25; peaches, 10; apples, 69; cherries, 8; quinces, 1; mulberry, 1; in all, 280.

The general crop was large. The season, however, was very wet, which, while it induced large-sized fruit and a heavy growth of wood, also furnished conditions that were favorable to the development of an unusual amount of fungus on many varieties of apples, as well as on some varieties of pears. The new wood of vines and trees seemed to be fairly well matured to go into winter.

Apples were an exceptionally heavy crop, probably one-third more than in 1900, Greenings, Snows, Holland Pippins, Baldwins, Spitzenbergs, and

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the Northern Spy were materially injured by the scab, the three former suffering the most. Golden Russet, Ribston, and Blenheim Pippin, Pewaukee, Gravenstein, Mann, Duchess and Astrachan were practically clean; while the King, Cranberry, Wagener, and Roxbury Russet were more or less spotted. The scab appeared to be the worst on the heavier soils, on the north side of the tree and in the lower branches.

The codling moth did not make much of a showing, partly owing, probably, to the superabundance of fruit, and partly to the free use of Burlap bands. Of the 450 barrels picked, we shipped 250, partly in boxes and partly in barrels to Glasgow and Liverpool, exporting even the tender Astrachan successfully to the latter market. The remaining 200 barrels were divided up between Toronto, Montreal and the local evaporater. The 39 varieties of Southern apples, top-grafted on Roxbury Russets last year, are living, with the exception of five sorts—Ingram, Paynes' Gatekeeper, Wythe, Kentucky Red Streak, and Keeper. Wandering Spy bore two or three apples 2 1-4 to 2 1-2 inches, small to medium, greenish white. Vandevere Pippin had one specimen, small, 2 1-4-inch, reddish. Some of the grafts are three and four feet long. The seven varieties of Southern apple trees are living, save a few of the Collins' Red. They have made very strong growth.

Pears were a fair crop. The Duchess spotted considerably, but the other varieties, barring the Flemish Beauty, were up to the mark. The Anjou, and Louise Bonne were exceptionally fine. As usual, we exported our pears in boxes to Glasgow, Manchester, and Liverpool, successfully sending Clapp's Favorite in cold storage to Liverpool. Up to date the varieties exported are: Bartlett, Clapp's Favorite, Anjou, Duchess, and Kieffer. These are also the leading commercial varieties in this district.

Plums were a light crop; 1,000 trees gave only about 400 (12-quart) baskets this year, as against 1,600 in 1901. There was considerable rot in the Lombard, Yellow Egg, and Reine Claude. The Bradshaw, Niagara, Quackenbos, and Satsuma (Japan) were of fine form and quality.

Peaches were a very heavy crop of fine quality. The leading varieties are the Champion, Crosby, Elberta, Early and Late Crawfords, Smock, and Tyhurst.

Cherries were a fair crop of excellent quality. Early Richmond, Montmorency, English Morello, May Duke, and Windsor are the leading varieties grown.

Grapes were a fine crop of good quality. All varieties ripened well except those that lost their leaves prematurely—the Wilder and Agawam. Delawares were exceptionally heavy. There was practically no mildew, not 100 pounds of a crop of 10 tons being rejected on that account. Pocklington, Eldorado, and Lady suffered somewhat from rot. I think that the Worden and Delaware are the most profitable grapes grown here.

Currants and Blackberries were a good crop of fine quality. (See notes.) Raspberries gave a satisfactory yield. Marlboro and Wilder lead for early reds, with Cuthbert and Loudon for later. Smith's Giant, Kansas, and Older rank first in the blacks, Columbia in the purple, and Golden Queen in yellow. The following raspberries may, I think, be eliminated from commercial plantations: All Summer, fruits from July to October (too long); it may be of interest to the amateur, but useless to the commercial grower; Japan Wineberry being scarlet-red, small, and acid; bush tender and unproductive; a novelty in its foliage, oriental and all that, but of no use here; Progress, black not productive enough; Redfield, purple, not a good cropper; Thompson, red, too shy a bearer. Received and planted last year a few Harris raspberries, three dwarf Alexander apples, two dwarf McIntosh apples, and three standard Bismarck apple trees. All are growing well.

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I used the insecticide soap for the cherry aphis, but saw no beneficial results.

For the past three years we have exported a few boxes each year to the Old Country of the "Honor Bright" tomato. They are a medium-sized, handsome, solid, late tomato, ripening in distinctively pronounced stages. I cut them off (leaving about one-half inch of stem adhering) when in the whitish-yellow stage. As a rule they reach Glasgow in good condition, netting her from 40 to 50 cents per box, which, although a fair price, is scarcely enoug for t e extra trouble. I do not know of any more promising export tomato.

A. W. PEART.

MAPLEHURST FRUIT STATION.

Probably the largest general collection of varieties of fruits to be seen anywhere in Canada, outside the Dominion Experimental Farms, is to be found on the grounds of the Secretary, Mr. L. Woolverton. There are now over eight hundred varieties planted, covering 5 1-4 acres, the object being to give him an opportunity to study the habits of growth and the bearing qualities of each tree, together with the characteristics and fruiting season of each fruit. While the cherry is a specialty at Maplehurst, there is a complete collection of peaches, pears, plums, grapes, apples, apricots, and small fruits; thus there are afforded endless opportunities of taking notes for use in preparing the matter for the work called the "Fruits of Ontario," in which are to be included all the principal varieties worthy of cultivation in this Province.

THE CHERRY HARVEST.

The cherry harvest is now becoming important in some sections of the Province. In that portion bordering on the south shore of Lake Ontario, and the north shore of Lake Erie, and, indeed, nearly all the east shore of Lake Huron, the more tender varieties of the sweet cherry class seem worthy of a place in a commercial way, but, even in these sections, a frost at the end of May or beginning of June is often fatal to the crop.

The earliest cherry of this class grown at Maplehurst is the Early Purple, which occasionally gives a full crop at highest prices, though a cherry of only medium size and ordinary quality. Some old trees have made a good record for productiveness, and made the owner a fine return, but as a rule the birds take a good share of the crop, and, if gathered before ripe enough to please the appetite of the birds, they are but "skin and bones," and not colored enough to deserve the name Purple. In England it is customary to protect valuable cherry trees from the birds by means of large nets, which are spread over the trees; a good suggestion for us if we want to succeed with certain varieties of Oxhearts.

This netting is sold very reasonably, as we note in a recent issue of the Journal of Holticulture several advertisements, such as the following:

Garden Netting. Small mesh, keeps out the smallest birds, oiled and dressed; will not rot if left out in all weathers; 105 yards by one yard wide, 72 cents; by two yards wide, $1.44; by three yards wide, $2.16, and so on to any width. G. H., Netting works, Rye.

Edge of Maryland says:

"For protecting cherries from the birds, I bought a lot of damaged mosquito netting, and sewed it into pieces six yards square. This I put over an Early Richmond tree and drew it together at the bottom. The sun shines through, but the birds are kept out. It stays on only a few days while the cherries are ripening, and is then taken off and laid away for another year."

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In our commercial orchards, however, we find it best to plant those which are not subject to the attack of birds, as, for example, the Biggarreau class, which have a flesh too firm for their beaks. Without attempting to make reference to the other varieties of sweet cherries, we commend two of our latest market kinds, the Elkhorn and Windsor. This latter has been introduced with a great flourish, and since it is of Canadian origin, we hope it may prove the best of its class. We have planted a few hundred trees, being so well pleased with the first samples borne in our experimental plot; but a few years' experience may be needed to determine whether it or the Elkhorn is the more valuable for the main crop. The latter has been grown for forty years at Maplehurst, and often bears a prodigious crop of fine dark fruit. Both ripen about the middle of July, when other varieties are out of the market, and consequently bring a good price. Both are subject to rot in wet seasons, but possibly we can control this by treatment with copper sulphate.

The English Morello is the best latest sour cherry. It is a famous cropper, dark in color, and will hang long after it is ripe. In the Western States it has been sold under the name of Wragg, and no doubt some nurserymen have been making money out of fruit-growers by selling this old variety under a new name. We have them both side by side in our experimental plot, and can see no difference whatever.

Of cooking cherries none can compare with Dukes, a class of semi-sour, red cherries, that cannot be excelled for sauce and pies. The May Duke is a familiar example of this class, which is frequently ready for use the latter part of June. Among the others of the class we have the Olivet, a sparse bearer, and most excellent in quality, and the Late Duke, which considerably prolongs the season, though otherwise very similar to the well-known May Duke.

The Board of Control of our fruit stations met at Maplehurst on the 5th of July. The new varieties of Duke cherries were of especial interest to the chairman, Dr. James Mills. There were five varieties noted down as suitable to keep up a succession for the market, and carrying immense loads of fruit for their age, viz., in order of ripening: May Duke, Royal Duke, California Advance, Late Duke and Louis Philippe, the first of which is over long before the latter begins ripening. These Dukes are a class of cherries which are a mean between the sweet and the sour cherries, and most desirable for all household uses. The peculiar upright habit and the close and continuous clustering of the fruit upon the underside of the long upright branches, at once distinguish the trees from those of other classes. One special variety of this class, the Reine Hortense, was especially admired because of its immense size and excellent flavor, but it is not as productive as the others.

The Cherry Aphis.

This insect has been most troublesome in our cherry orchard, and during the past season we determined to try a very fine spray of crude petroleum. We secured the finest possible nozzle, and on the 1st May, just before the buds opened, we applied the crude petroleum in the form of a fine mist. On the 2nd May we followed this with an application of Bordeaux, but we found this would not stick on the trees, owing to the oil.

On the 1st of June we examined the trees, and could find no aphis, except upon an occasional young leaf, and we could detect no injury from the application of crude petroleum.

On the 10th of June a few aphidae appeared on the end of the twigs, but not in sufficient numbers to damage the crop.

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Thinning Fruit.

Experiments in thinning fruit, conducted at Maplehurst for some years, go to prove that with peaches especially the time and labor is a well-spent investment. We have found the size of our Alexander peaches upon overloaded trees so much increased that the total number of baskets harvested from a tree which had been thinned to nearly one-half was quite equal to that from its mate, left unthinned. Besides this, the color was better on the thinned fruit. There was less inclination to rot, and the quality was considerably improved. As a consequence, the cash value of the crop was largely increased.

Our own experience in this matter was quite well supported by that of our neighbor, Mr. John Brennan. Walking through his Alexander orchard on the 28th of June, we found the ground literally covered with young fruit. "People," said Mr. Brennan, "are calling me a fool to waste my fruit like this, but I have learned by experience that thinning pays."

"What portion do you take off?"

"Well, from those overloaded Alexanders, fully one-half. Here is a tree from which I took 1,700 peaches on the 26th of June. The tree could never carry that quantity to perfection. Why, 100 peaches, well grown, would fill a twelve-quart basket, and that tree was carrying enough peaches to fill over 30 twelve-quart baskets, while eight or ten baskets is all it could possibly mature to any size."

Effect on Plums. Experiments made at the Wisconsin Experiment Station seem to prove that equally good results may be had from thinning plums, as we have had with peaches. About four-fifths of the fruit was removed from a portion of a tree of Gale Seedling plums, leaving the fruit about two inches apart on the branches, while the other branches are left untouched.

Effect on Apples. While the results in the case of apples may not be so clear as with peaches and plums, still the effect on the tree is no unimportant factor, for when our orchard trees overbear, as they did in 1896, it takes three or four years for them to fully recover their vitality. Indeed, if one may judge from evidences, it is only this year of 1902, six years after that enormous exhausting crop, that our apple trees have recovered their wonted vigor.

The Massachusetts Station has reported on results of thinning apples as follows:

A tree each of Gravenstein and Tetofsky apples was thinned on July 1st, and a similar tree of each variety left unthinned as a check. In case of the Gravenstein, the yield on the thinned and unthinned trees respectively was: first quality fruit, 9 bushels and 2 1-2 bushels; second quality fruit, 1 bushel and 2 1-2 bushels; windfalls, 9 1-2 bushels and 10 1-2 bushels. In the case of Tetofsky, the thinned trees gave 1 bushel of windfalls, and the unthinned trees 3 bushels; of second quality fruit, the yield was one-half bushel from each tree, and of first quality fruit the thinned tree yielded 2 bushels and the unthinned tree none at all. Allowing 60 cents per bushel for firsts and 25 cents per bushel for seconds, the market value of the thinned Gravenstein apples was over twice as much as that of the unthinned, and of the thinned Tetofsky apples eleven times as much as that of the unthinned. It cost 48 cents to thin the Gravenstein and 25 cents to thin the Tetofsky. The net gain due to thinning was 85 cents for the Tetofsky and $1.85 for the Gravenstein. It is thought that the results would have been more pronounced if the thinning had been done two weeks earlier. The large percentage of windfalls in case of the Tetofsky was believed to be largely

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due to the fact that the apples have very short stems, and are borne in clusters of from three to eight fruits each, so that as they grow they become very much crowded. With trees having this characteristic, therefore, thinning is especially valuable. L. WOOLVERTON.

EAST CENTRAL STATION.

Our fruit crop was not all that we could have wished for as to quality, yet the quantity in some measure made up. We began spraying on March 28th, as I firmly believe in early spraying. We used whale oil soap and Bordeaux mixture, dissolving soap with warm water and then adding the Bordeaux, making a fine emulsion. This was the only satisfactory spraying we did all through, for although we sprayed four or five times afterwards, the rains invariably came on and washed a large percentage off before it had time to do its work, and, in consequence, a large percentage of our fruit was spotted more than ever before.

About one hundred of our young pears and plums were imported, and, fearing the various kinds of scales and insects, I concluded to try the crude oil treatment. I am not sure whether that was the cause of the injury, but some twelve of our finest plum trees, that have been fruiting for several years, never showed a leaf this spring. The winter of 1901 and 1902 was the mildest we have had for the past twenty-five years, the thermometer not going below 12 1-2 below zero ; we frequently have it 20 degrees and more without injury to the trees.

In my report I have confined myself to those varieties sent me by the Board of Control, several of which are worthless here for market, which I have marked for the inspector, and which I think ought to be top-grafted next spring. Our cultivation consisted first, in pruning in March; second, in spraying frequently, and, third, in working the land till the fruit interfered by bending the branches. All the trees are in fine condition of growth, as you will see by the report. The quantity of fruit gathered has also been taken down at the time of gathering, so as to get at the exact data of the different varieties. The varieties not reported on did not fruit, but all made satisfactory growth. The two hundred trees planted on our farm were grown in clover sod, which was plowed and made to enrich the land, the clover being dragged under with a chain. The trees have done remarkably well. The varieties that were most affected with scab were : Fameuse, about 70 per cent.; Chenango, about 90 per cent.; Spy, 25 per cent.; Baldwin, 15 per cent.; Canada Red, 40 per cent.; while King, Minkler, and Haas were from 10 to 20 per cent. affected. Boston Star, Gideon, Wealthy, Ribston, and Western Beauty were clean and large.

Bartletts were not as good either in quantity or quality as formerly, while Duchess, Anjou, and Lawrence were better than usual. The currants sent me were magnificent, viz., London Market, Prince Albert, and Victoria Black ; some of our Empress were badly mildewed on account of wet weather, and did not ripen well. Strawberries were an immense crop, and lasted late in the season. This is the first time we have had a good crop of peaches ; they were fine and large, the varieties being Fitzgerald and Longhurst.

Berries of all kinds were good in quality and quantity.

In the beginning of the season the price of apples ran from $1.50 down to 90 cents, but at present the latter figure is about the top, as buyers are over-stocked and apple barrels have gone up to $35 per hundred. Another season we will box all our best fruit for the English market.

I would suggest that those varieties which have proved almost worthless as commercial fruit should be re-grafted with some valuable kinds of winter fruit. R. L. HUGGARD.

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Georgian Bay Fruit Station.

This has been a season of most peculiar extremes, alternate cold and wet predominating, which in some ways retarded vegetation, and in other ways encouraged a luxuriant growth. But it has not been without its object lessons; for instance, in the development of fungous diseases, and as regards cultivation. This season I have noticed, and so have many others, that fruit on apple trees growing in grain or grass has been cleaner and better colored than the fruit in the well-cultivated orchard, which clearly shows that in a year like this it is quite possible to conserve too much moisture. It would, therefore, seem better in a spring of much cold and wet to commence cultivation somewhat later than usual, especially in apple orchards.

There are now in test at this station 170 varieties of plums. Many of them are now in bearing, which enabled us to place on exhibition at Toronto 120 different kinds. Among this large list there are, to be sure, many varieties which are very indifferent in quality and productiveness, but it is of equal importance to know the poor ones as the good. The best of the old, well-tried Europeans are as yet the most profitable.

We have just gathered the finest crop of plums we ever grew. The orchard received thorough and clean cultivation during the early summer, and was carefully sprayed with Bordeaux and Paris green, three ounces to the 50-gallon barrel. Although this has been one of the worst seasons for shot-hole fungus, and while most trees in the neighboring orchards have lost their leaves weeks ago, some of them as bare as winter, our trees are still healthy and green, only a very few showing the slightest bareness, and that only on the tips of the young wood. The orchards are now green with a beautiful covering of red and crimson clover, which will be plowed under next spring, and the cultivation will again go on as above.

The Japan Plums. The Japan plums are mostly very strong growers and good bearers, but their quality is rather against them, as compared with our best European varieties, and I cannot advise planting them very extensively. Many of them have a pronounced acrid or almond flavor, becoming almost bitter in such varieties as Willard, Ogon, Berckman's Hatankio, etc.

The American or native plums are all too small in size, indifferent in quality, and unattractive in appearance to be of any value in the commercial orchards of Ontario. They are usually, however, very strong growers, and make good stocks to work better varieties on. Some of our best plums are grown as top grafts on these varieties.

What to Plant. I am often asked to recommend varieties for planting. Climatic conditions and locations are so varied that this is difficult only in a general way. Some like dark plums; others want light ones. The tendency of the market now seems to favor the light-colored varieties, believing them to be sweeter. For my own planting I would use the following, to cover the whole season in the order named: Red June (a Japan), Washington, Bradshaw, Burbank, Quackenbos or Glass, Prune d'Agen, Arch Duke, Diamond, Yellow Egg, Pond's Seedling, Coe's Golden Drop, and Reine Claude. This list is sufficiently large, and pretty well covers the whole season; besides, fewer varieties give least trouble.

Peaches. This has been another good year for peaches here. It is only a few years since peaches were tried here to any extent, but we now feel confident that with careful selection they can be grown in sufficient quantity to at least meet the local demand. Such varieties as Red Canada, Triumph, Fitzgerald, Tyehurst, Bowslaugh's Late, Crosby, Champion, Wonderful, etc., have been bearing well, some trees bending and breaking with their loads of fruit.

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Pears. Pears have only been about a good half crop, but of excellent quality. The following varieties are succeeding remarkably well: Beurre d'Anjou, Bartlett, Beurre Clairgeau, Belle Lucrative, Flemish Beauty, Duchess, Clapp's Favorite, Howell, Kieffer, etc. Quite a number of our young trees are beginning to fruit, but not in sufficient quantity to make any particular mention of them. I believe it will be only a few years when we shall be able to prove that pears can be grown here nearly as well as apples. I can well remember when it was thought useless to plant anything but Flemish Beauty, but, thanks first to the Fruit Growers' Association, and later to the experiment stations, that is all changed.

I have seen it claimed several times during the past year that it was no longer possible to grow clean Flemish Beauty pears. We sprayed our trees with Bordeaux, first, when buds were swelling; second, when blossoms began to burst; third, when fruit had set and petals had fallen. The fruit is as clean and handsome as could be desired.

Owing to the cold and wet spring grapes bloomed rather late, and unless we have a warm fall some of them may not ripen well. Champion, Moore's Diamond, Green Mountain, Niagara, and Brighton are maturing very well.

JOHN MITCHELL.

LAKE HURON STATION.

The season just passed has been a very trying one to the fruit grower, owing to the extremely wet, cold weather. The winter of 1901 and 1902 was a very mild one, the lowest degree of frost was only 10 degrees below zero. The spring opened up very early with summer-like weather, but cold weather set in the early part of May and continued so throughout the season. On May 10th and 11th we had twelve degrees of frost, but no damage was done except to some of the young growth of the raspberries, and on May 27th we had a cold rain, with some snow, still it did not seem to injure the bloom any.

Very little planting was done at this station in the experimental plots. Two varieties of apples, one variety of raspberry, and three varieties of plums were added to the large list now growing at this station.

One thing very disappointing to the experimenter after caring for a tree or plant, is that when it commences to bear fruit he often finds it is some old and worthless variety. This has happened at this station. I think the nurseryman who sends out trees incorrectly named ought to be prosecuted.

All classes of fungus were very prevalent, especially the black spot, and twig and fire blight.

Insects were not so troublesome as some years. There was a small green worm that bored in the apple from the outside in the later part of the season, which has never been noticed before.

New Fruits. Among the newer fruits that commenced to bear this season are three of the French pears planted two years ago:

Citron de Carmes, fruit rather small; quality not very good, tart; ripe August 1st.

Dr. Jules-Guyot, this one bloomed in July; fruit medium size, not tested yet for quality.

Dr. Jougre, fruit large; resembles Clairgeau; not ready at time of writing.

The apple crop this season was anything but satisfactory. They were very small and spotted, not more than one-third fit for market, especially the Spys.

The pear crop was very good. Fruit large and clean, and all sold at fair prices.

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The plum crop was not so large as last season but was of better quality. The plum orchard at this station is continuing to grow vigorously, and is becoming a very profitable part of the farm.

The cherry crop was very light, not over one-third. The Black Knot is still prevalent, but the Lake Huron Fruit Growers' Association petitioned the Brant Township Council to appoint an inspector and it has been done. The cherry trees at this station continue to make a good growth and are doing well. But I cannot give any report as to the yield, as the birds took the entire crop with the exception of a few baskets. I have never seen the waxwing and the robin so numerous as the past season.

A. E. SHERRINGTON.

SIMCOE FRUIT STATION.

This has been a peculiar season, such as may occur perhaps only once in a lifetime. Never, in the history of this country, have we had such an excess of moisture, or such a cool summer; and this has had a peculiar effect on the fruit crop. The winter of 1901-2 was the mildest in point of temperature for thirty years; the lowest temperature recorded here being scarcely ten below zero. As a result of this all kinds of fruit buds came through the winter in fine condition, and there was an abundance of bloom. But cool weather, with alternate frosts and rain, spoiled the early blooming fruits such as plums and cherries; and frequent rains during the time of the apple bloom spoilt the prospects in most of the orchards in this district; more particularly in the winter apples. Early apples, such as Duchess and Astrachan, however, were a full crop. Some varieties of fall apples were a fair crop, while others were very poor. The peculiar thing about the winter apples was that there was no uniformity about the crop. They were what might be termed patchy, that is, some orchards have a full average crop and some above average; while others, in the same section, were almost barren.

In my own orchard the Duchess have a heavy crop, the fall apples were below average and the winter apples set a large crop; but continued to drop until past midsummer, when there was little left. The Spys, however, were a little better than the others. I attribute this to imperfect fertilization of the blossoms, the Spys blooming later during better weather probably making a difference in their favor. The orchards giving the best crops were almost invariably on high rolling land, and, no doubt, atmospheric drainage had a good deal to do with it. Small fruits, such as strawberries, raspberries, and blackberries were a record crop. The abundant moisture seemed to suit them, and we gathered berries continuously from June until well into September.

I have tested a great many varieties of strawberries, and my main crop consists of Crescent and Williams. The Crescent is the most profitable strawberry among upwards of a hundred varieties tested. I have tested many of the much lauded, fine looking varieties, and many of them certainly produced fine berries, of good quality, but when you picked them over about three times they were done. I want a berry that will give you fairly good pickings for two weeks, or more, and the Crescent will do this better than any other variety I have tested. It will pay better at 5 or 6 cents a box, than many of the others would do at 25.

I have been testing several varieties of Russian Apricots, viz.—Gibb, Nicholas, Alexander, and Purple Apricot. I might sum up my experience with them in this advice to intending planters: Don't plant them; to do so would be only time and money wasted.

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Insect pests were in evidence but no worse than in other years. There were scarcely any of the tent caterpillars, and I think this pest will not be troublesome for some time again.

Curculio was very bad; I presume on account of the small crop of plums they were able to concentrate their efforts. Codling moths were plentiful.

I believe the bandaging of trees with burlap, if properly attended to throughout the season, would almost exterminate the moth.

Nothing in the experimental plots has failed since my last report. With the exception of the blight on the foliage of the cherries noted in this report, everything has continued to make a satisfactory growth, and apparently is doing well.

G. C. CASTON.

SOUTH WESTERN FRUIT STATION.

The past season has not been favorable to the fruit grower. The spring was cold and backward, May, June and July were unusually wet and cold and proved disastrous to many of our fruits. Apples suffered least. They were a large crop, much above the average both in quantity and quality. The buyers however, are not all living up to their agreement, and considerable loss will result from this cause. On account of the orchards yielding more good fruit than the buyers expected, and not being able to dispose of the surplus to advantage, a large quantity has been left on the hands of the grower.

Most varieties are unusually free from scab especially in orchards that were sprayed with Bordeaux mixture.

W. W. HILBORN.

STRAWBERRY STATION.

The past season was quite exceptional, in many respects different from any that we ever remember to have had, so that few varieties were left at their normal condition.

The spring was on the whole very cold and wet, some few quite warm days, but on the whole the season of fruiting was what may be called cold.

After the earlier varieties had begun to blossom, we had three or four quite severe frosts, one that froze ice 1-5 of an inch on pail standing on pump platform. These frosts destroyed not only a large part of the first blossoms, but many unopened buds, so severely that many of the strawberry growers in our section at once declared that the entire crop of strawberries was gone—killed by the frosts. Happily their surmises were not at all correct; for it was found that enough buds had been untouched to make one of the best crops we have had for some time, the cool showery weather prolonged the season until the middle of July. Some kinds were very much more injured than others. Nick Ohmer, Sampson, Wm. Belt, Marshall, Seaford, and Margaret were hurt seriously, while there were others, such as Klondike, Saunders, Hunn, Sample, Woolverton, and Empress injured only very slightly or not at all. There was a great deal of rain in June, on June 25th ground was thoroughly soaked; again on the 29th it rained all day and part of the 30th. This was just what the late varieties required. While the days were warm the nights were quite cool, ideal weather for producing the best strawberries. On July 2nd there was a good picking of Brandywine, Joe, Klondike, Hunn (last picking of Bismarck); good of Dew, Gandy, Emperor, Miller, Wm. Belt, Sample, Senator Dunlap; while opinions differ in many places on many of the varieties, Senator Dunlap seems to have done well wherever it has fruited. On July 4th there was a good picking of Joe, Nettie, 11.59 p.m. or Hales' Midnight, Hunn, Klondike, Sample, Gandy. This has been a season in which the medium and late varieties have beaten the early kinds, 10 to 1—an ideal season for late var-

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ieties. I never saw them do nearly as well. There was a very large crop and good prices all through the season. Again I wish to repeat that the narrow system has come out ahead, and the "wide row" must go, although, perhaps, three-fourths of all the strawberries grown are grown on this plan. But progressive fruit growers are finding out that it is not the most profitable way. I will give you just one instance: A grower, a progressive one, prepared one acre of ground, well manured it with stable manure, well worked in, and got good plants set in rows three feet apart. The varieties were Williams and Clyde. Kept rows of plants narrow, about 18 inches, leaving a good path for the pickers. In fall gave a dressing of unleached hardwood ashes, and a slight covering of long, strawy manure. In the spring this was raked into the paths, which acted as a mulch, and kept the berries clean. The ground had been kept well cultivated, and clear of all weeds. The result: First season there were 600 crates picked from that one acre, or 14,600 boxes, and the grower lost fully 50 crates during the hot spell, when he could not get help to pick them, and that many were wasted. There were over 500 crates picked from that acre the past season, which was the second year of fruiting for that piece of ground. That acre of ground produced as much as the ordinary grower gets from three or four acres grown in the ordinary way. As I have said, the past was a good strawberry season, lasting from about June 10th, when the first berries began to be picked, such as Monitor, Honest Charlie, and the well-known Michel, Van Deman, Johnson, August Luther, and Bederwood, until the middle of July, when the last of Nettie, Hunn, Klondike, and Gandy were picked. It was a season of very fine berries; some of the finest I ever saw were grown this past season. Some boxes I picked of Hunn, Sample, Glen Mary, Brandywine, Saunders, Miller New York, Uncle Jim, Corsican, Klondike, Bismarck, Bubach, Haverland, Monitor, Parson's Beauty, I never saw surpassed for size and beauty.

Notes on Season of Picking.

Season of Different Varieties. The season of some of the different varieties was as follows:

June 20th. A good picking of Carrie, Overholt's Special, Manwell, also of Kansas, a good cropper. (First picking of Hero.) Good picking of Bederwood, and third picking of August Luther, a good cropper; first picking of Uncle Jim, large and fine, also first picking of Glen Mary, very large berries: also first of Emperor, Empress and Parson's Beauty, fine berry; first of Marie and Gertrude.

June 23rd. Good picking Splendid, Leader, Glen Mary, Jucunda (imported), Irene, Annie Laurie, and Monitor, a splendid variety; good of McKinley, Klondike, Parson's Beauty, Clyde, August Luther, Michel. First picking of Joe, Senator Dunlap, Williams, Wm. Belt and Jersey Queen; good picking of Aroma, Manwell, Woolverton, Sample, Kansas, Saunders, Corsican, New York, and Uncle Jim. First picking of Triumph de Gand, and Star; good picking of Greenville, Cobden, Queen, Fountain, Bederwood, and Hero; Crescent, small and poor; good of Lovett, Tennessee Prolific, Pride of Cumberland, Marie and Gertrude; Saunders was better than Lovett or Williams. These last three resemble each other very much in the berry, but not in the plant. We are now in the thick of the season; all varieties are bearing except the very late ones, such as Nettie, 11.59 p.m., and Robbie. No berries yet ripe on these varieties; not ripe before July 1st.

I was particularly pleased with the showing Monitor made the past season, its first fruiting here. The berry is large, roundish, bright and attractive; the plant is thrifty and very productive. It comes amongst the early ones, and, I think, will prove profitable.

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New ones placed in our trial plot for first time are as follows: Auto, Armstrong, Bush Cluster, Benjamin, Chellie, Dewey, Drought King, Echo, Epicure, Family Favorite, Granville, Great Ruby, Hawaii, Lady Garrison, Lester Lovett, Luxury, Lyon, Palmer's E., Success, Superior, Sutherland, Shephard, Saint Antoine de Padone, Mark Hanna, Mrs. Mark Hanna, Nichol's No. 6, New Globe, Repeater, Texas, Thompson's Nos. 500, 203, and 202, Uncle Sam, Vandevere, Virous, and Ryckman, and 13 of J. H. Black's pedigreed seedlings sent me by Mr. Black for trial, viz.: Joe, Reba, Nettie, Robbie, Stella, mon, Carrie Silvers, Howard, Prof. Fisher, Mrs. Fisher, Hazel, Leon, and Ham. With one or two exceptions these have made a very good growth, and we will be able to report on them after fruiting next season.

Early and Extra Early Varieties. August Luther, Michel, Monitor, Van Deman, Johnson's Early, Excelsior, Smith's Lord Sheffield, Clyde, Staples, Bederwood, Marshall.

Mid Season to Late. Haverland, Splendid, Tennessee, Prolific, Honest Charlie, Kansas, Hero, Marie, Bismarck, Ruby, Glen Mary, Saunders, Williams, Lovett, Brandywine, Sample, Ruby, Bubach, Miller, Senator Dunlap, Nick Ohmer, Empress.

Late. Aroma, Uncle Jim, Klondike, Hunn, Gandy, Emperor Joe, Nettie, Robbie, Timbrell 18, Dew, Empress, 11.59 p.m. or Midnight, Rough Rider, etc. There is quite a difference of opinion on some of the above varieties, depending on the difference of the soil in which they are grown and the way they are treated.

E. B. STEVENSON.

ST. LAWRENCE EXPERIMENT STATION.

The winter of 1901-02 was all that could be desired from a fruit grower's point of view. On November 12th we had a light fall of snow, followed about a week later by a second, which, remaining until well into March, kept the ground from freezing all winter. The winter temperatures were normal, with no very sudden changes from high to low. The only severe test the trees had was on the 10th of May. The trees were then almost in bloom, when the thermometer dropped a few degrees below freezing, with a high wind, which injured the centre blossom in many clusters on the apple, and did serious injury to all early blooming plums and cherries.

Field mice were very destructive in unprotected orchards during the winter. In some orchards of young trees more than half were completely ruined. My young orchards were successfully protected by wrapping with ordinary building paper for about 10 to 12 inches from the ground. Out of 700 trees wrapped only one was injured, and that was done above the paper. I cannot recommend tar paper, and wish to warn people against using it, for I have seen injury to the bark in many cases.

Fungi caused serious damage here, as elsewhere in the Province, but I found that from four to five sprayings gave me a crop with from 85 per cent. to 90 per cent. clean fruit. Most of the sprayings were made between showers, as it rained almost continually during the past summer, but by being careful to spray when the foliage was dry I obtained good results, even though it rained a short time after the spraying was done.

Insects were apparently few in number, but by close observation one found the smaller insects (really the ones that do the most damage) out in their usual numbers, but were later in hatching or moving from winter quarters. Bud moth gave me the most trouble, and I had also to fight an attack of Tussock moth. These insects appeared in large numbers, and began eating the young apples when about the size of cherries, and injured a lot of my fruit before I got them under control.

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The black soap from France for treating the aphis I applied to a row of cherry and plum trees with markedly good results. The foliage on the treated trees retained a bright, glossy green, and the aphis was almost all destroyed. I find strong tobacco water and soap also a satisfactory treatment for aphis, and not injurious, like kerosene emulsion.

My plums and pears were kept under a treatment of clean cultivation until July 9th, when cultivation ceased, and I allowed a cover crop to grow. The ground was fertilized with a cover crop plowed under in the spring, and a light dressing of manure and muriate of potash applied.

A good many people from the surrounding neighborhood, and some from a distance visited my orchards to see for themselves what varieties to plant before placing their orders with the nurserymen.

HAROLD JONES.

WABIGOON STATION.

As stated in my report last spring, all our fruit suffered severely during the winter of 1901-02, the ground freezing to the depth of over six feet, and there being very little snow until January. The only trees that survived were one Ostheim cherry, one De Soto plum, one Transcendent crab, and two Whitney crab. The crabs only showed any vigor this season. I may state that I have eighteen trees grown from seed from Siberia now two years old. In the spring they were alive to the top bud. They are now about three feet high. If any of these prove of value, grafts can be made on hardy stocks of crab varieties. I think it useless to send any tender varieties to this climate.

Gooseberries have proved nearly a complete failure, as well as black raspberries.

Strawberries, owing to having been too heavily covered with strawy manure, rotted some plants. Those that survived gave a good yield of excellent fruit. This year we have covered them with chaff and straw. All the raspberry canes have been laid down and covered with straw. Next year I expect to have definite results to report, as the ground is now covered with eight inches of snow, which will assist very materially to protect the bushes and vines. From the short experience that has been obtained here, crabs (in the line of trees), red raspberries, strawberries and black currants are hardy enough to grow a profitable crop.

If I can furnish any further or fuller information along any line, I will be pleased to do so.

A. E. ANNIS.

WINONA FRUIT STATION.

Plums. There was not a heavy set of plums, but nearly enough for an average crop, had the rot not destroyed fully one-half or more of some varieties. Early spraying does not appear to be a remedy for the plum rot. Our orchards were sprayed thoroughly with seven pounds of copper sulphate, instead of four, to the barrel, with the expectation of destroying all fungus on the trees and on the ground under them. This was done the last week in April, both sides of the rows were very thoroughly covered. As soon as the plums had set they were again sprayed with five pounds to the barrel, and again in two weeks with four pounds. The weather being dry, and the foliage and fruit looking very healthy, spraying was discontinued. About the middle of July the weather became showery, raining nearly every day, which caused the rot to spread much worse that it has ever been known. The fungus continued to spread until the plums were picked. Red June, Reine Claude, and Monarch sold higher than any other varieties. Red June, on account of earliness; Reine Claude and Monarch, both good quality, and ripening after the

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rush of plums is over. Lincoln is a very fine, large, red, sweet plum of most excellent quality, and early, but the tree is a rather slow grower. With this year's experience I would strike Washington out of the list of plums to plant for profit. In one of our orchards we have a row of fifty-five trees of Washington; the next row on one side is Bradshaw, on the other Lombard. The same number of trees of each were planted at the same time, the cultivation, spraying, and all treatment was the same, and the Bradshaw row yielded 335 baskets, the Lombard 264, and Washington only 15. The difference in other years has not been quite as great. Many of the plum trees sent to this station are not true to name, and, not being an expert in plums, I do not undertake to give descriptions of varieties.

Insects. Our experience with the San Jose scale this season goes to prove that it can be controlled, if not entirely eradicated. On the first inspection here four trees were found to be infested. These trees were fumigated with cyanide of potash, and all trees near them thoroughly sprayed with two and one half pounds of whale oil soap to the gallon.

On a subsequent inspection three more trees were found, adjoining the first. These and all trees near them were sprayed by Mr. Fisher with his petroleum emulsion. These trees have all been carefully examined, and no appearance of live scale has been found.

M. PETTIT.

NOTES BY THE SECRETARY.

OUR EXHIBIT AT THE INDUSTRIAL.

The display of fruits from our fruit stations was exceedingly good this year. Each of our experimenters arranged his fruit in alphabetical order, for convenience of singling out any variety under consideration; and the labels, being written out boldly with a shading pen by our assistant, were a most important feature.

The whole was superintended by Mr. W. M. Orr, of Fruitland, who has had long experience in exhibition work. The exhibit was held during the second week only of the Industrial, but we hope to be able to continue from the beginning to the end, as it is one of the most important exhibits in the fruit building, affording an opportunity to other exhibitors to compare notes with the experimenters, and to correct misnamed varieties in their exhibits.

DISCARDED VARIETIES.

One of the most important features of our fruit station work is the warning of our fruit growers against planting inferior varieties. Almost every nurseryman's catalogue is loaded up with a whole list of inferior kinds which he carries simply because they are still asked for; and he will be greatly obliged to us if he can educate the grower to discard them. In our future exhibits we intend making a special table of such varieties, so that growers can see at a glance why we have discarded them. Another feature will be the showing up of varieties which are too much boomed. There are always unscrupulous dealers who want to trade upon varieties before their value is known, and we want to test all such fruits, and where they are not superior to varieties in cultivation we want to warn the growers against them.

FINE FRENCH PEARS FOR ONTARIO.

We have noticed in our experimental plot several varieties of pears worthy of the attention of our fruit growers. One is Triomphe de Vienne, which is of about the same season as Bartlett, but larger in size; and another

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is the Hoosic, which is a trifle later, but is not only larger than the Bartlett, but has a fine red cheek, and is of excellent quality. Dr. Charles Saunders of Ottawa, was particularly taken with a beautiful dwarf tree of this variety at Maplehurst, which was bending down with its tremendous load, and took a photograph of it for the exposition at St. Louis. Surely it would be a splendid export variety.

Japan Plums.

The Chabot plums (pronounced "shabbot") is coming to the front rank among the Japan varieties. It fruited this year for the first time at Maplehurst, and we first noted that the tree was fairly productive, and the fruit large and most attractive in color. Next we tested its flavor, and were surprised at its excellence; it was tender, juicy and of a delicious flavor.

It was a little disappointing, however, to see this plum, as grown in the Beaver Valley, in the Georgian Bay district, and shown by Mr. John Mitchell, our experimenter there; for in his exhibit it was much smaller, and apparently quite inferior. Conditions of moisture, richness and cultivation of soil must have much to do with these differences, and should be further investigated. "In my opinion," said Mr. Orr, of Fruitland, "the best three Japan plants are Red June, Burbank, and Satsuma. I do not know the Chabot, and, of course, it may displace one of these. Satsuma is blood red in flesh, and very desirable for canning purposes."

"In my opinion," said Mr. John Mitchell, our Clarksburg experimenter in plums, "the three best Japans are Red June, Chabot, and Burbank. I also think very highly of the Satsuma, and would place it fourth on my list, for it is productive, quite hardy, and a splendid preserving plum."

Fairly Good Reports of Fruit Exported to Glasgow.

When the fruit growers of Ontario have learned to produce only fruit of the best quality, and never to allow inferior samples upon a tree to reach maturity, they will have learned the secret of success in fruit growing. Then we can ship with confidence to any market and expect reasonable results.

Every week since August 1st, when Astrachans began to ripen, we have kept up steady and successive shipments of apples and pears, with varying success, but, on the whole, with encouraging results.

With the exception of one lot to Manchester and one to Liverpool, all these have gone to Glasgow, and a recent mail has brought us the following report by John Brown, inspector at Glasgow, an extract of which may be of interest:

(*Marina Shipment.*)

The 953 C's shipped by L. Woolverton consisted of Wilson C's of pears and apples, ½ C's pears, 40 lb. boxes apples, 2 C's plums, 3 large Wilson C's peaches. The pears were packed in the half C's in wood shavings with no paper on them; the variety was principally Bartlett. These showed up very well, although some were very ripe. The pears in the Wilson C's showed up well also, and the Duchess apples in Wilson C's were the best Duchess I have seen this season. The peaches were very wasty, and only about a third of each case was fit for use. These were put up in special cases with no ventilation whatever, which I think had something to do with the condition they arrived in. They are, in any case, a dangerous fruit to ship. The two cases Washington Plums were useless. The following are the prices:

Bartlett Pears in Wilson C's	6s. 3d.	8s.
Duchess Apples do	5s.	6s.
Bartlett Pears, ½ C's	5s.	5s. 9d.
Apples, 40 lb. boxes	6s. 3d.	6s. 6d.

I have seen two of the largest buyers of the Bartlett pears, both of whom report: the pears they got went sleepy, and after three or four days were quite useless.

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(*Lakonia Shipment.*)

L. Woolverton, Pears and Apples.—The pears were packed in half cases in Excelsior packing, without being packed separately in paper. This packing was (for pears) rather coarse; something of a finer and softer nature would, I think, be more suitable and less likely to bruise the fruit. I also advocate the wrapping of each pear separately in paper, the same as the Californian pears, using the same kind of paper. Some of the pears were packed in Wilson cases. There was no paper on these either, with the result that a good many were bruised. The half case is going to be the most popular package here, as it relatively contains more fruit and is less expensive than the Wilson case. The latter would only pay with fruit of exceptional quality. The apples were packed in special cases holding about 40 lbs. of fruit. They were in layers with a great deal of Excelsior packing between each layer. This, I think, is quite unnecessary, a layer of Excelsior being sufficient, as buyers naturally prefer a box full of apples rather than two-thirds and one-third packing. Woolverton also sent a sample Wilson case of peaches and a sample case tomatoes. The former showed up well, each peach being wrapped up separately in paper and mostly in good order; the latter were a failure, the tomatoes being soft and useless. The following are prices realized:

Bartlett Pears, ½ C's, 3s 9d., 7s. 8d. Some ripe others extra good.
Louise Bonne Pears, ½ C's, 2s. 6d., 4s .6d. Green and good.
Flemish Beauty, ½ C's, 3s., 3s. 6d. Green and hard.
Duchess, ½ C's, 4s. 3d. Very good.
Bartlett's, Wilson's C's, 3s. 6d., 5s. 3d. Wasty and irregular.
Apples, Wilson's C's, 3s. 9d., 7s. 3d. Kings made highest price.
Peaches, Wilson's C's, 6s. 3d.
Tomatoes, Wilson's C's, 2s., 2s. 3d.

APPLES.

Notes by G. C. Caston (Simcoe Fruit Station).

Some varieties fruited this year for the first time.

Shackleford. Planted in 1895; tree healthy, vigorous, spreading in habit of growth; fruit medium to large; skin dark green, splashed and streaked with dark red; calyx partly closed; stem short, set in a deep, narrow cavity; flesh coarse, acid, with no pronounced flavor; probably a fair cooker, and would keep until well on in winter.

Hamilton. Planted in 1897, bore for the first time a few specimens this year; tree a thrifty grower, spreading; fruit above medium size, roundish oblate; calyx large, partly closed, in a wide, uneven basin; stem short, set in a deep narrow cavity; skin yellow, waxy in appearance; flesh whitish, watery; water core, fairly good flavor; I doubt if it will be of value, though a clean, handsome-looking apple.

Sherwood's Favorite. This is an old variety, known as Chenango Strawberry, and sometimes called Sheep's Nose. I fruited it years ago from scions, which were sent me under the name of Stump. It is so well known that it is not necessary to describe it. Some esteem it highly as a dessert variety, and it certainly has considerable merit in that line. I would not advise anyone to plant it extensively. One tree in an orchard would be enough.

Banks. An apple grown from scions sent me under the name of Bank's Red Gravenstein, which has fruited this year. It is a handsome apple, above medium size, elongated and ribbed. Calyx closed in a shallow basin; stem very short, in a deep cavity; skin dark green, overspread with bright red; flesh white, with a slightly sweet, agreeable flavor. In my opinion when fully ripe this would scale up pretty high as a dessert apple. It is a clean, handsome, attractive-looking apple, and I think it will likely be well worthy of cultivation. It will evidently keep until midwinter at least.

Peerless. This is an apple described in former reports, but I am inclined to think it is one of the best varieties yet tested for its season. It came from Minnesota in 1895, where it originated. It is said to be a seedling of

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Duchess of Oldenberg. It was introduced as a winter apple, but it cannot be classed as other than a late fall apple, though it would keep until Christmas, I think, fairly well. The tree is not a fast grower, but it is very healthy and hardy, and is inclined to an upward habit of growth. It began to bear the second year, and has borne every year since. At first the fruit was scarcely above medium size, and did not attract attention particularly; but, as the tree grows older, the fruit improves in size and beauty, until now there is no variety on the whole list that I know of that is its equal in appearance. It is very uniform in size, averaging three inches in diameter; in shape it resembles the King; it is perfectly clean and free from scab. The skin is red, varying from bright scarlet to dark red; flesh white, crisp, juicy, with a brisk, spicy flavor. As a cooking apple this variety excels; indeed, I think I am safe in saying that it has no equal as a cooker, and I believe this variety would rank very high in the British market, if transported in good condition. We are growing too many fall apples now in this country, and not enough of the standard commercial winter varieties, and I think we should be very careful about extending the list, unless they are possessed of special merit. But, unless I am greatly mistaken, we have a valuable new apple in the Peerless. I believe there is money in it.

Several varieties of Russians fruited this year were of such poor quality that they are not worth describing. It would be a waste of time. The best that can be said of these Russian, or most of them a least, is that, being hardy, they may succeed in cold sections of the country where better varieties fail, and would be better than no apple at all.

Gano. This variety, called by some Black Ben Davis, I still believe to be a decided improvement on the Ben Davis. It bears just as early, keeps just as long, and is superior to it as a cooking apple. We only use Ben Davis for cooking in late spring or early summer, when other varieties are gone, but we find Gano has just as long a season, and makes a far better sauce, as it develops quite a spicy flavor in cooking. I would plant it in preference to Ben Davis.

Ontario. For this section, this is one of the coming apples. It is doing well here, and, on account of its early bearing and good appearance, coupled with good quality, it is very desirable as a commercial market apple.

McIntosh Red. What a pity this variety is so subject to scab. It is almost impossible in a season like this to keep it clean. I consider it one of the very best dessert apples on the list. It will do best on high rolling land, with the trees well apart, well pruned and sprayed. Under these conditions it will do fairly well, but in general it is an unsatisfactory apple to grow in my district.

Shiawassee Beauty. This seedling of the Fameuse is doing well here. It bears well, and the fruit is clean. Trees planted in 1895 now bear about a bushel each. Fruit large, somewhat flattened; skin green, overspread with dark red, quite handsome; flesh white, juicy, with a distinct Fameuse flavor. This will be decidedly the most profitable of the Fameuse seedlings. I have Scarlet Pippin top grafted, but I don't think much of it.

Princess Louise is as bad as McIntosh Red for scab; it is almost impossible to keep it clean.

Notes by W. H. Dempsey (Bay of Quinte Fruit Station).

Apples were about an average crop this year. The quality, however, was not up to the standard. The cold, wet weather early in the season made it very difficult to retain the Bordeaux mixture on the trees, and it was necessary to spray nearly every day. The trees in the experimental plot have made good

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growth this season, have always been thoroughly cultivated, and a hoe crop of corn and potatoes planted between the rows of trees, but never closer to the tree than six feet. Many of the varieties have borne a few samples this year.

Trees planted in 1896 of Yates Red bore heavily, but were too small to be of any commercial value. Dudley's Winter fruited this year for the first and was fully ripe in October; it was very handsome on the tree.

One tree of Downing's Winter Maiden's Blush had three medium sized waxy yellow apples. Western Beauty bore about one bushel to the tree. It is very much like Wealthy, and ripens at the same time.

Peter had about a peck to the tree. It also is similar to Wealthy, and ripens at the same time.

Boiken had a bushel to the tree, and the fruit was very handsome on the tree. Walter Pease yielded a peck of dull striped apples which ripened in August. Barry gave twelve poor looking samples of apples of no value whatever. Starr produced six medium sized yellow apples which ripened in September, with no appearance of ever being of any value.

Sutton's Beauty has never formed any fruit buds yet. Gano, planted in 1898, had four handsome apples this year.

Bismarck fruits every year, though the tree is no larger than a currant bush. It is no doubt one of the earliest varieties to come into bearing; it is large and handsome but coarse, and only a cooker.

Windsor Chief. Top grafted 1895; strong grower; fruit 2¾ x 2½ in., roundish conical; skin yellow, almost covered with bright red, darker on the side next the sun, with numerous large grey dots; calyx partially open, set in an even basin; stem ½ in., medium, set in a broad cavity; flesh yellowish-white, coarse, crisp, mildly acid; fair quality; season March and April. Has only borne a few apples each year, until this year it bore a heavy crop, and they hung well to the tree till the last of October. It would no doubt be a profitable apple to grow if it would come into bearing earlier. It is of handsome appearance, very similar to Baldwin, and kept in good condition through April. In fact I had it till last of May.

Winter Fameuse. Top grafted 1896; of medium growth; fruit 2 x 2¾ in.; roundish, oblate; skin lemon yellow, nearly covered with streaks of red with splashes of darker red and numerous small, grey dots, not so bright in color as Fameuse; calyx closed, set in a moderately deep basin; stem ½ to ¾ in. medium, set in a broad uneven cavity; flesh white, tender, juicy, good quality; core small; season January to March. The tree has not come into fruiting as early as the Fameuse, but I think it will fruit fully as well, though very uneven in size and much more subject to fungus. It will not take the place of the many good winter varieties we already have.

Coo's River Beauty (Oregon seedling). Top grafted in 1897; vigorous grower; foliage medium; fruit 2¾ x 3 in., roundish oblate; skin smooth, yellow, nearly covered with bright red with streaks and splashes of darker red, with a few prominent grey dots; calyx large, nearly closed, set in a moderately deep basin; stem ¾ in, medium, set in a broad, deep russetted cavity; core small; flesh white, crisp, firm and juicy; season November and December. The tree has borne medium crops each year for the last three years, and is quite subject to fungus both in fruit and foliage. A very handsome apple in the basket.

Palouse. Top grafted 1896; a medium grower; foliage medium: 2¾ x 3 in., oblong, conical: skin yellow, streaked and splashed with red; calyx partly open, set in an uneven basin; stem 1 inch, slender, set in a narrow, deep cavity; flesh yellowish, a little coarse, juicy, sub-acid; quality good; season October and November; quite subject to fungi; yields abundantly.

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NOTES BY HAROLD JONES (ST. LAWRENCE FRUIT STATION).

The following varieties fruited with me this year in the experimental plot; Ontario, Longfield, Chenango, Strawberry, Peter, Salome, McIntosh, Yellow Transparent, Late Strawberry, Red Astrachan, Milwaukee, Hamilton, McMahon White, and Northwest Greening.

These trees were planted in 1896. Trees planted in 1897 and bearing are: Magog, Red Streak, Arabka, Excelsior, Boiken, Roman Stem, Shackleford, Fannie, Peach of Montreal, and Montreal Beauty.

Longfield. This much advertised variety will prove a disappointment to those planting it for profit. It is an early and heavy bearer, inclined to overbear, but it matures a crop of apples too small to be of any commercial value. Its fruit is thin-skinned, of a light color and shows bruises and finger marks. Its season is September and October, instead of being a winter apple as it is claimed to be.

Milwaukee is the most promising variety yet tested, from a commercial standpoint. This is a seedling of the Duchess by Jeffreys. The tree takes the character of the parent. It is an early and heavy bearer. Fruit large in size, 3 x 2 1-2 inches; color, yellowish green, blushed and streaked on the sunny side; calyx, closed, in wide shallow basin; stem, slender, one-half inch in a narrow deep basin; flesh, rather coarse; brisk acid; no aroma; season from November to March. This variety is more suitable for cooking than for a table apple.

Peter. This apple is similar in every respect to the Wealthy and should hardly be classed as a distinct variety.

Salome has fruited with me for the second time, and although the tree is a hardy, vigorous grower, the fruit has proved very unsatisfactory, being of small size, less than two inches in diameter, poorly colored and liable to drop before maturity.

In the St. Lawrence Valley we have yet to find an apple that will be as profitable to the grower, tree for tree, or acre for acre, as the Fameuse, and apples belonging to that group, such as the McIntosh, Scarlet Pippin, etc. These apples grow to perfection, and when kept free of spot, command the very highest prices, and are sought for in all the markets, both at home and abroad.

NOTES BY CHARLES YOUNG (ALGOMA FRUIT STATION).

I have now at this station over forty varieties of apples under test, some are doing remarkably well, and a few have proved too tender. It is rather too early yet to say which should be discarded as some reputed tender varieties so far have proved quite hardy; while some others, Transparent for instance, supposed to be iron clad, have shown a tendency to sun scald. Of the apples planted in 1899 the following have fruited this year: Duchess, Yellow Transparent, Wealthy, Wolf River, Scott's Winter and Longfield, the latter yielding a heavy crop. I would not alter the list of desirable apples for Northern Ontario. A few new varieties are coming well to the front, but want a further trial before recommending them to plant, except for testing. Some, which have been extensively planted, Ben Davis for instance, are so far not desirable: the tree is healthy and vigorous, but the fruit is small, poorly colored and apparently out of its climate. Sweet Bough is too tender; Wallbridge is our best long keeper; the appearance is good, quality second class to eat, good for cooking.

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NOTES BY R. L. HUGGARD, (*East Central Station*).

Number.	Varieties of Apples.	Class.	Age.	Vigor. In. of growth.	Vigor. Hardiness. Scale 1-10.	Productiveness. Yield in quarts per tree.	Productiveness. Scale 1-10.	Season. 1st and last.	Remarks
	Alexander	Fall	6 yrs.	30	8	1 peck	Large	Sept. and Oct.	Fine large fall apple.
	Baxter	Winter	6 "	26	7	3 quarts	9	Jan.-April	Badly spotted this year.
	Ben Davis	"	6 "	24	9	½ bushel	7	Feb.-May	Spotted ; not well colored.
	Bell de Boskoop	"	6 "	22	7	2 quarts	8	Jan.-March	Clean fruit ; dark green.
x	Bethel	Fall	6 "	24	5	1 quart	8	Nov.-Dec.	Spotted and rough.
x	Chenango Strawberry	Early Fall	6 "	15	5	3 peaks	7 to 8	September	No use only for cider
	Duchess	Fall	6 "	20	10	1 bushel	9	September	Very fine and clear.
	Fameuse	"	6 "	17	7	1 peck	5	Oct. and Nov.	Very badly spotted.
	Gravenstein	"	6 "	24	6	10 samples	6	Nov. and Dec	Clean fruit.
	Gideon	"	6 "	26	8	1½ bushels	9	Oct. and Nov.	Very large, clean and fine.
	Green Newton Pippin	Winter	6 "	20	8	30 samples	5	January	Medium good quality.
	King of Tompkins	"	6 "	35	7	1 peck	10	Nov. and Dec.	Very fine and well colored clean fruit.
x	Longfield	Fall	6 "	30	10	1 bushel	4	Oct. to Nov.	Too small for export.
	Mann	Winter	6 "	20	7	12 samples	8	Jan. to March	Clean fruit and good quality.
x	McIntosh Red	Fall	6 "	24	6	20 "	6	November	Bad color and shape ; no good here.
x	Peter		6 "	20	7	6 "	5	December	Not very promising.
	Russian No. 277	Fall	5 "	20	9	30 "	8	September	Large, clean, coarse fruit.
	Russian No. 230	"	5 "	18	9	50 "	7	September	Resembles Duchess ; not so good.
	Red Canada	Winter	5 "	15	8	½ peck	6	Jan. and April	Spotted considerably.
	Red Bietigheimer	Summer	6 "	25	8	25 samples	10	Aug. and Sept.	No improvement on Fillbasket.
	Salome	Winter	6 "	20	8	½ bushel	7	Jan. to May	Smooth, clean, and beautiful color.
	Sutton's Beauty	"	6 "	14	6	10 samples	7	Nov. to July	Rather rough skin.
	Stark	"	6 "	30	9	20 "	8	Nov. and Jan.	A medium apple ; very vigorous grower.
	Stump								No use here.
	Scott's Winter	Winter	5 "	22	8	17 samples	6	Nov. and Jan	Rather small fruit.
	Tetofsky	Summer	6 "	12	5	3 quarts	8	Aug. and Sept.	Not as good as Transparent.
	Winter Maiden's Blush	Winter	6 "	17	7	17 samples	6	January	Requires further test.
	Walbridge	"	6 "	18	6	1 peck	5	Jan. and Feb.	Too small for commerce.
	Winter Greening	"	6 "	22	8	25 samples	7	January	Appears promising.
	Wealthy	Fall	6 "	20	10	½ bushel	6	November	Clean and a great bearer.
	Wolf River	Late fall	6 "	28	9	1 peck	10	Oct. and Dec.	Fine, clean, large, well col'rd, very attr'ctv
	Western Beauty	Fall	6 "	24	9	1 bushel	9	Sept. and Oct.	A very fine fall apple.
x	Wine Sap		6 "	20	7	10 samples	2		No use here ; too small.
	Wellington		6 "	18	7	few samples	7	Late fall	Only medium.
	York Imperial		5 "			3 samples			Promising.

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NOTES BY W. W. HILBORN (SOUTH WESTERN FRUIT STATION).

The past season has not been favorable to the fruit grower. The spring was cold and backward. May, June and July were unusually wet and cold and proved disastrous to many of our fruits.

Apples suffered least, they were a large crop, much above the average both in quantity and quality. The buyers however are not all living up to their agreement, and considerable loss will result from this cause. On account of the orchards yielding more good fruit than the buyers expected, and not being able to dispose of the surplus to advantage, a large quantity has been left in the hands of the grower. Most varieties are unusually free from scab, especially in orchards that were sprayed with Bordeaux mixture.

BLACKBERRIES.

NOTES BY A. W PEART (BURLINGTON STATION).

Blackberries were a fine crop. Few, if any, dried up, the frequent rains leading to a continuously moist condition of the soil. Owing to the summerless nature of the summer, both blooming and ripening were considerably later than the average, the former about a week and the latter probably ten days.

In weeding out undesirable varieties of blackberries the following are classified as too tender for this district: Early Cluster, Early Harvest, Minnewaski and Ancient Briton. These sorts are considered too unproductive for commercial purposes: Maxwell, a very fine berry, but a weak, light grower; Wachusetts, Dorchester, Eldorado, Wilson's Junior and Child's Tree, Lovett's Best, Gainor, Early King and Wilson's Early, deserve further trial.

The leading varieties for the planter appear to be the Agawam, Kittatinny, Ohmer, Snyder, Stone's Hardy, Taylor and Western Triumph.

Agawam. Cane upright, spreading, hardy, vigorous and productive; berry roundish-oblong, medium size 7-8 x 3-4 inch, sweet, but rather insipid. Season medium, July 25-Aug. 20. A standard variety.

Ancient Briton. Cane upright, spreading, medium vigor, but tender and unproductive. Berry oblong, conical, medium size, 7-8 x 3-4 inch, good flavor. Season medium, July 25—Aug. 20.

Child's Tree. Cane spreading, vinous in habit, hardy, fairly vigorous, but unproductive; berry ovate-round, small to medium, 3-4 x 1-2 inch, firm, sweet and sprightly in flavor. Season medium, July 25—Aug. 20.

Dorchester. Cane upright, spreading, very vigorous, hardy, but a poor bearer. Berry, large to very large, 1 1-8 x 3-4 inch, roundish-oblong, firm, of fine quality. Season medium, July 25—Aug. 20.

Early Cluster. Cane upright, moderately vigorous, but tender and unproductive. Berry roundish-oblong, medium size 7-8 x 3-4 inch, of good quality. Season medium to late, July 28—Aug. 25. Evidently misnamed "early."

Early Harvest. Cane upright, stiff, medium vigor, tender, but very productive; berry medium to large, 1 x 3-4 inch, oblong, conical, fair in quality. Season early, July 15—Aug. 5.

Early King. Cane upright, spreading, medium vigor, somewhat tender, but quite productive. Berry small to medium, 3-4 x 5-8, roundish oblong, quality good. Season early to medium, July 18—Aug. 10.

Eldorado. Cane upright, spreading, vigorous, hardy, but not very productive; berry medium to large, 7-8 x 3-4, oblong, conical, sprightly flavor. Season medium, July 25—Aug. 20.

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Erie. Cane upright, spreading, vigorous, hardy, and productive; berry medium, 7-8 x 3-4, roundish, conical. Season medium, July 25—Aug. 20.

Gainor. Cane upright, vigorous, hardy and productive. Berry very large 1 1-4 x 7-8 inch, roundish oblong, fine in quality. Season, medium, July 25—Aug. 20. Promises well.

Kittatinny. Cane upright, very strong and vigorous, hardy and productive; berry large to very large, 1 1-8 x 3-4, ovate, oblong, rich and juicy. Season late, July 30—Aug. 30. One of the best commercial varieties.

Lovett's Best. Cane upright, stiff, hardy and productive. Berry oblong, round, small, 3-4 x 5-8; quality fair. Season late, July 30—Aug. 30.

Maxwell. Cane being weak and light spreading and unproductive; berry roundish, oblong, large to very large, 1 x 3-4 inch of excellent quality. season medium, July 25—Aug. 20.

Minnewaski. Cane upright, spreading, vigorous, but tender and unproductive; berry medium to large, 7-8 x 3-4, roundish, oblong, of good quality. Season early to medium, July 20—Aug. 15.

Ohmer. Cane upright, spreading, vigorous, productive, and hardy; berry very large, 1 1-4 x 3-4, oblong, oval; quality good. Season medium, July 25-August 20.

Snyder. Cane upright, moderately vigorous, hardy, and very productive; berry medium size, 7-8 x 3-4; oblong, oval; of good quality. Season early to medium, July 20—August 15. Requires a rich soil. One of the best varieties for market.

Stone's Hardy. Cane upright, spreading, hardy, vigorous, and productive; be ry oblong, oval, medium, 3-4 x 5-8, quality good. Season medium, July 25—August 20. A very promising variety.

Taylor. Cane upright, vigorous, hardy, and productive; berry medium size, 7-8 x 3-4, oblong-oval. quality good. Season medium, July 25—August 20. A valuable commercial berry.

Wachusetts. Cane almost thornless, upright, vigorous, hardy, but not p oductive. Berry of fine quality; medium size, 3-4 x 5-8; roundish-oblong. Season medium to late, July 25—August 25.

Western Triumph. Cane upright, strong, and vigorous; hardy and very p oductive. Berry medium, 7-8 x 3-4; roundish-oblong; of good quality. Season medium, July 25—August 20. A good market berry, but requires a damp, rich soil.

Wilson's Early. Cane upright, medium; vigorous, hardy, and fairly productive. Berry large, 1 x 3-4; oblong-round. Quality good. Season medium, July 25—August 20.

Wilson's Junior. Cane vinous in habit, trailing, spreading, hardy, but a poor cropper; berry medium, 7-8 x 3-4, oval, oblong, sweet. Season medium, July 25—August 20. Propagates by both tips and suckers.

Blackberries appear to thrive best on soils having a quicksand bottom; very heavy croppers as the Snyder and Western Triumph, should be pruned severely.

NOTES BY A. E. SHERRINGTON (LAKE HURON FRUIT STATION).

Agawam. A strong vigorous grower, healthy and hardy; fruit, large; quality good; ripe Aug. 16th; yield 403 oz.

Ancient Briton. Plant fairly vigorous, hardy; fruit, medium; quality poor; ripe May 16th; yield 108 oz.

Eldorado. A strong vigorous grower, healthy and hardy; fruit, large; quality best; ripe Aug. 8th; yield 555 oz.

Early Cluster. Plant a strong grower; rather tender; fruit very large; quality good; ripe Aug. 19th; yield 199 oz.

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Gainor. Plant a strong grower, hardy; fruit very large; quality, good; ripe, August 13th; yield 185 oz.

Ohmer. Plant strong, vigorous and hardy; fruit large; quality good; ripe Aug. 16th; yield 59 oz.

Stone's Early. Plant vigorous, hardy and productive; fruit large, quality good; ripe Aug. 13th; yield 65 oz.

Snyder. Plant strong, healthy and hardy; fruit medium; quality fair; ripe Aug. 19th; yield 511 oz.

Taylor. Plant strong, vigorous and hardy; fruit, large; quality very good; ripe Aug. 13th; yield 184 oz.

Wilson's Junior. Plant a weak grower; tender fruit; very large; quality good; ripe Aug. 13th; yield 165 oz.

Wachusetts. This is a thornless variety; plant not as vigorous as it ought to be; tender; fruit medium; quality good; ripe Aug. 8th; yield 200 oz.

The most profitable blackberries are the Eldorado, Agawam and Synder, in order named.

Notes by G. C. Caston (Simcoe Fruit Station).

In blackberries I have tested about 15 varieties, and have narrowed them down to two, and these two fill the bill for this locality. They are the Eldorado and Agawam. These two have given excellent results. They do not lose any of the bearing wood during the cold of winter, and give excellent crops, both in quantity and quality. And I recommend these two varieties for this section with the greatest confidence.

Notes by L. Woolverton (Cherry Station).

This has been an exceptionally good season for cherries in Ontario. The dry May seemed to largely destroy the fungus rot, (Monilia) so that, in spite of a wet June and July, the cherries were comparatively free from this evil. The aphis too, which is one of the worst pests of the cherry tree, has been less troublesome than usual. A large portion of the experimental orchard was sprayed with an exceedingly fine spray of undiluted crude petroleum, just at the time of the opening of the buds, to destroy the young aphidae, and this seemed to be effective. Injury to the trees was predicted by many, but so far, July 28th, the trees are in good condition.

The experimental plot consists of a deep rich sandy loam, which causes too vigorous a growth of wood, and consequently the trees are less productive than if the soil were a clay loam. The following are a few notes on the behavior of some of the varieties under test :

Abbesse. Similar to Downer's Late.

Belle De Choisy. A sweet Duke, and one of the most delicious of eating cherries. Usually a shy bearer, this year it bore a good crop. Season July 1—15, in 1902.

Black Eagle. A delicious black cherry, but as usual the trees were very unproductive. The crop was too small to pay as a market cherry; besides it soon becomes too soft to handle.

Black Tartarian. Set a heavy crop, but thinned out very much before maturity. The fruit ripens somewhat unevenly; berry sweet and tasty; was relished by the robins, which took a large share of the crop. The season was from July 15—30.

California Advance. Similar to Late Duke; in season 1st to 10th of July.

Centennial. This came to us described as a large firm cherry. Probably it is not correct, for it is similar to La Maurie. Ripe June 13—20, and mostly taken by birds and boys; sweet but too small.

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Cleveland. The best White Oxheart; in season from June 19 to July 1st; som were hanging as late as July 8th. The crop was good, for the size of the tree, the fruit better colored than Governor Wood.

Downer's Late. Ripe about 13th July, but a small crop. Cherry very good quality, and similar to Abbesse on our grounds.

Dyehouse. Very similar to Richmond, quite as early and about as productive. In season June 19—29.

Early Purple. Harvested June 21st, a tree six years old yielded 25 quarts, but they were gathered before fully ripe or all the cherries would have been taken by the birds.

Elkhorn. Yield was better than Windsor, and less inclined to rot. In season June 23rd to July 1st.

English Morello. Constant rains made this cherry begin rotting about July 25th, before fully mature, and on this account it was harvested at that time. The yield was very large, quite equal to that of Montmorency; disputes the claim for first place for commercial purposes with Montmorency.

Governor Wood. Was much wanted in the market; one tree 40 years old yielded 40 quarts, an unusually small yield; an 8 year old tree yielded 18 quarts; and a 6 year old tree 12 quarts. In season June 19 to 27.

King's Amorelle. (Purity?) This with the other Amarelles, red or Kentish cherries, was given thorough cultivation; tree quite productive, equal to Montmorency; fruit firm, of good size; in season June 25 to July 10.

Knight's Early Black. Tree a fine vigorous grower, and very productive; in season June 23rd to July 1st; birds troublesome about 27th, when at its best.

Late Duke. (California Advance?) Tree very productive; a perfect picture, the very finest of the Dukes; not inclined to rot; ripens early and evenly, in season July 1st to 15th.

Lutoka. Tree not productive this season; fruit subject to blight and curculio.

May Duke. Excellent for house use because of its long season; ripens unevenly, beginning about July 1st.

Montmorency. Trees bore great loads of beautiful fruit. In season July 15th to 30th.

Montmorency Ordinaire. Same as Montmorency.

Morello. (English.) Tree most productive; a competitor of the Montmorency for profit. Ripe about August 1st.

Napoleon Bigarreau. Tree very productive; rotted quickly after gathering; would not carry in good order more than twelve hours; ripe July 5th.

Olivet. Tree was not productive; fruit scattered but very large; a very dark rich red; in season July 10th to 20th.

Ostheim. Tree unproductive; cherries very scattered; quality good but small, dark red; ripe July 21st; valuable only at the north.

Orel. Tree bears young and heavily; a pie cherry in season between Early Richmond and Montmorency.

Plymouth. Tree of Duke habit; very productive; not attacked by birds or rot; a fine shipper, keeps a long while; seems to be best late, light-colored sweet cherry.

Purity. Probably same as King's Amarelle.

Reine Hortense. Tree six years old; very full of very large, fine cherries, evenly distributed; ripe in 1902 on July 8.

Rockport. Tree very productive; fruit usually nearly all rots on the tree, but this season there was no rot, owing to the dry May, and the fruit was so good that it was packed directly off the trees into the shipping baskets; in season June 23rd to July 1st.

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Royal Duke. Tree not so productive as Late Duke, fruit not equal to Late Duke.

Schmidt's Bigarreau. Tree six years planted in sandy loam made magnificent growth, but bore very few cherries; fruit very large, black, sweet and rich; in season July 10th to 20th.

Schatten Amarelle. Probably same as Brusseler Braune.

Suda. Hardy; much like English Morello.

Windsor. Tree too vigorous in sandy loam, to be productive; on clay loam one of the most productive kinds, subject to rot on sand, but not on clay: in season July 15th to 25th.

Wragg. Same as English Morello.

Yellow Spanish. Tree more productive than usual, but fruit thinned by blighting; and not so large as usual. Harvested July 2nd.

Season of Ripening.

Variety.	1899.	1900.
Belle de Choisy	June 22-July 2-4	June 27-July 12.
Black Tartarian	June 25-July 10	June 25-July 12.
Black Eagle	July 4	July 4-July 13.
Belle Magnifique	July 16	July 12-August 1.
Cleveland	June 17-July 3	June 15-July 10.
Early Purple	June 10-June 27	
Empress Eugenie	June 16-July 5	June 16-July 7.
Elton	June 21-July 2-10	June 20-July 5.
Governor Wood	June 20-July 6-10	June 17-July 5.
Late Duke	June 27-July 6-10	June 28-July 12.
Ida	July 10	July 6.
English Morello	July 10	July 9.
May Duke	June 15-July 6	June 16-July 11.
Montmorency		June 30.
Olivet	June 24-July 5-10	June 28-July 13.
Ohio Beauty	June 16-July 4	June 20-July 18.
Orel		June 19.
King's Amarelle		July 7.
Mercer		June 25-July 1.
Dyehouse		June 21.
Knight Early		June 25.
Schatten Amarelle		July 5.
Strauss Weichlel		July 5.
Spate Amarelle		July 10-19.
Rockport Bigarreau		July 8.
Ostheim		July 10.
California Advance		July 13.
Suda Hardy		July 13.
Plymouth		July 8-14.
Purity		June 28.
Royal Duke	June 30	June 26-July 18.
Reiné Hortense		June 28-July 28.
Wragg	July 10	July 9.
Downer's Late		July 5.
Schmitz's Bigarreau		No change.
Windsor		July 7.
Centennial		June 4.
Rockport		June 19.
Napoleon		June 28-July 13.
Yellow Spanish		June 25-July 13.
Early Maurie		June 15.
Early Richmond		June 21.

Notes by W. W. Hilborn (Southwestern Station).

Cherries promised a large yield early in the season, but the latter unfavorable weather destroyed a large portion of them. Sweet varieties were nearly all destroyed by rot (Monilia). Rain occurred nearly every day for a

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week just before they began to ripen, and most of the fruit was destroyed while yet unripe. Sour varieties did not suffer much from this cause, but a hail storm in this locality injured about one-half of the crop to such an extent that they were not fit for market. A mysterious disease has appeared among the sour cherries, that is causing considerable uneasiness. I first noticed it last season on some Montmorency trees. The leaves turn yellow and drop off when the fruit is about half grown. The fruit of course did not fully mature on the trees most affected. Those injured most last season died this season. They came out in leaf and set a crop of fruit which grew to about half its normal size, when the foliage again turned yellow and dropped off and the trees died. This season the disease has affected nearly all the trees in this locality, especially those grown on sandy loam, to a greater or less extent. All sour varieties appear to be susceptible to the disease.

NOTES BY G. C. CASTON (SIMCOE FRUIT STATION).

Cherries were almost a total failure this year; the unfavorable weather during bloom and the cool, wet summer was against them. Then a peculiar blight attacked the foliage, a kind of sporadic fungus, causing the leaves to become spotted, then turn yellow, and then fall off, leaving some of the trees almost bare. Whether this is the advent of a new disease or the effects of the cool, wet summer, and excess of moisture, I am unable to say. We only got in one real good spraying this year and that was early. When the time came for successive sprayings, it was raining three days in the week, and we gave it up. I believe that cherries like corn, revel in hot weather. In the summer of '91 I had a fine crop of cherries, and the hotter the weather the better they seemed to be. I have frequently watered plum trees, in hot dry weather, to stop them from dropping their fruit when heavily loaded, and have been successful. but cherries seem to enjoy hot dry weather. Wet cool weather in summer seems to be decidedly against them. All my tree fruits get clean cultivation. Several varieties bore a few specimens, but they never seemed to mature properly, and lacked flavor. The trees affected most by the foliage blight, were English Morello, Wragg, Bessarabian and Shatten Amarelle. I think probably that next year, with normal weather conditions and thorough and persistent spraying, there will not be any further trouble from this disease.

No varieties fruited this year that have not been described in former reports.

CURRANTS.

NOTES BY A. W. PEART (BURLINGTON FRUIT STATION).

Currants were a good crop. Many of the red and white varieties, such as the Red Dutch Versailles, Belle de St. Giles, White Grape, White Imperial, North Star, Brayley, and Fay's Prolific, lost their entire foliage prematurely, thus materially injuring the crop. Pomona, Red Cross, Wilder and Cherry, suffered somewhat, while the New Victoria, Raby Castle, and Old Victoria were entirely exempt from the fungus.

The currant worm was destroyed by spraying with Paris green, 1 lb. to 250 gallons of water, using a double spramotor nozzle. The black varieties were exempt from disease of any kind.

The leading commercial varieties tested so far are: Red: Wilder, Cherry, Pomona, Fay's Prolific, Red Victoria and North Star. Black; Saunders, Naples. Black Victoria, and Collin's Prolific. The last kind appears to be an uncertain cropper—one year very heavy and the next very light. The White

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Grape still leads the Imperial in point of productiveness. Like the blackberries they were later in blooming and ripening than the normal.

Belle de St. Giles. Bush spreading, medium vigor, healthy and hardy, but rather a shy bearer; bunch long and compact; berry red, large 1-2 inch in diameter; sub-acid of fine quality; season, medium, July 10th to Aug. 5th. A large showy, but unproductive currant, yield per bush 3 lbs.

Black Victoria. Bush a light grower, spreading, healthy, hardy and productive; berry large, 1-2 inch, firm, sweet, of excellent quality; season medium, July 15th to Aug. 10th. Yield 5 lbs. A good commercial variety.

Brayley's Seedling. Bush moderately vigorous, upright, healthy, hardy and fairly productive; bunch, long, straggling, loose; berry red, medium size 3-4 inch, very acid; season, medium, July 10th to Aug. 5th. Yield 4 lbs.

Champion. (Origin England.) Bush, upright, vigorous, healthy, hardy and moderately productive; berry very large 5-8 inch, black, somewhat acid; season, late, July 25th to Aug. 15th. Yield 4 lbs.; like Collin's Prolific, it is a very variable cropper from year to year.

Cherry. (Origin Europe.) Bush upright, vigorous, hardy, healthy, and very productive; bunch, short and compact; berry, dark red, firm, large 1-2 inch, acid; season, medium, July 10th to Aug. 5th; yield 6 lbs. per bush. A standard commercial currant of the older types.

Collin's Prolific. Bush an upright, spreading, rampant grower, hardy and variable in yield from year to year; berry large 1-2 to 5-8, firm, acid; season, medium to late, July 20th to Aug. 10th; yield 1902, 3 lbs.

Crandall. Bush somewhat spreading, very strong and vigorous grower, hardy, healthy and productive; berry, variable in size, 3-8 to 3-4 inch, uneven in ripening, bluish-black, sub-acid; season, July 20th to Sept. 1st; yield 5 lbs.

Fay's Prolific. (Origin New York.) Probably a cross between Cherry and Victoria. Bush, spreading, moderate grower, hardy, healthy and fairly productive; bunch, very long, somewhat loose; berry, large to very large, 1-2 to 5 8 inch, red firm, sub-acid; season, medium, July 10th to Aug. 5th; yield 4 lbs.

Lee's Prolific. (Origin England.) Bush spreading, moderately vigorous, healthy, hardy, fairly productive; berry, black, very large, 1-2 to 5-8 inch, sub-acid; season, medium, July 15th to Aug. 10th; yield, 1902, 3 1-2 lbs. per bush. This currant as well as Fay's Prolific requires careful cultivation for the best results.

Naples. (Origin Europe.) Bush spreading, vigorous, hardy, healthy and very productive; berry, large 1-2 inch, black, sub-acid; season, medium, July 15th to Aug. 10th; yield, 4 lbs. One of the old reliable kinds.

New Victoria. Bush spreading, vigorous, hardy and productive; bunch long and loose; berry red, small to medium, 3-8 inch, acid, but agreeable flavor; season, medium, July 10th to Aug. 5th; yield 6 lbs.

North Star. (Origin Minnesota.) Bush medium vigor, upright, hardy, healthy and productive; bunch, medium length, compact; berry, red, medium to large, 3-8 to 1-2 inch, acid, sprightly; season, medium to late, July 15th to Aug. 10th; yield, 1902, 6 lbs. A desirable late currant.

Pomona. Bush spreading, moderate grower, healthy, hardy and productive; bunch, long, compact; berry, red, large, 1-2 inch, sub-acid, excellent quality; season, medium, July 10th to Aug. 5th; yield 6 lbs. A very promising currant.

Prince Albert. Bush moderate grower, spreading, healthy, hardy and productive; leaves, large, deeply cut; bunch, short to medium; berry, small to medium, 3-8 inch, red, very acid; season, late, July 15th to Aug. 10th; yield 5 lbs.

Raby Castle. (Origin Canada.) Bush upright, very vigorous, hardy, healthy, and very productive; bunch, short and compact; berry red, small to

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med.um, 3-8 inch, firm, acid; season, medium, July 10th to Aug. 5th; yield 6 1-2 lbs. Very productive, but too small for good price.

Red Cross. (Origin New York.) Probably a cross between Cherry and White Grape; bush, spreading, vigorous, hardy, healthy, and productive; bunch, short and compact; berry, small to medium, 3-8 inch, red, firm, sprightly, sub-acid; season, medium, July 15th to Aug. 10th; yield, 5 lbs. Rather small for commercial purposes.

Red Dutch. (Origin Europe.) Bush upright, vigorous, healthy, hardy, and very productive; bunch, medium length, loose; berry, red, small, 1-3 to 3-8, sub-acid, of fine flavor; season early to medium, July 10th to Aug. 5th; yield 8 lbs. Rather too small for profit.

Red Victoria. Bush upright, vigorous, hardy, and very productive; foliage dark geen, deeply cut; bunch, long and loose; berry, large, 1-2 inch, bright red, tenacious, firm, acid; season, medium, July 10th to Aug. 5th; yield 8 lbs. A leading commercial variety.

Saun ers. (Origin Ontario.) Bush upright-spreading, vigorous, hardy, healthy and productive; berry, black, large, 1-2 inch, of a good sub-acid flavor; season, medium, July 15th to Aug. 10th; yield 4 lbs. A very promising currant.

Versailles. (Origin France.) Bush spreading; moderately vigorous, healthy, hardy, and fairly productive; bunch medium length, rather compact; berry red, medium size, 3-8-inch; not so acid as the cherry. Season early to medium, July 10-August 5. Yield 4 pounds.

White Grape. (Origin Europe.) Bush spreading; moderately vigorous, productive; bunch long and loose; berry white, large, 1-2-inch; sub-acid; pleasant flavor. Season medium to late, July 15-August 10. Yield 6 pounds.

White Imperial. Bush fairly vigorous, spreading, hardy, healthy; moderately productive; bunch long and loose; berry white, medium to large, 3 8 to 1-2 inch; fine quality. Season medium, July 10-August 5. Yield 4 pounds.

Wilder. (Origin New York.) Bush vigorous, hardy, healthy and very productive; bunch medium length, compact; berry red, large, 1-2-inch; sub-acid; of excellent quality. Season medium, July 10-August 5. Yield 6 pounds. One of the best all-around currants tested.

From past experience here, the following may be omitted from a commercial list: Belle de St. Giles, Raby Castle, Red Cross, Red Dutch, Versailles, and Champion.

NOTES BY A. E. SHERRINGTON (LAKE HURON FRUIT STATION).

The crop of the past season has been quite satisfactory, although Pomona and Versailles were somewhat affected with blight, so much so that the foliage all dropped, but not before the fruit was matured.

Black Victoria. Bush strong and vigorous, hardy; fruit large; quality good; yield 7 ounces; 3 years old.

Cherry. Bush slow grower, not as vigorous as the Fay's; fruit very large; quality good; color red; yield 62 ounces.

Champion. Bush a strong, vigorous grower; fruit large, black; quality good; yield 87 ounces.

Fay. A strong, vigorous grower; healthy and hardy; fruit very large; color red; quality good; yield 62 ounces. One of the best.

Naples. A strong, vigorous grower, healthy, and hardy; very productive; fruit very large; quality good; color black; yield 87 ounces.

North Star. Bush partly vigorous, of spreading habit; canes small; fruit small, red; quality poor.

Pomona. Bush a strong, compact grower; hardy, but fruit and foliage destroyed by blight.

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Prince Albert. A strong, upright grower; healthy and hardy; fruit medium; color red; quality fair; yield 89 ounces.

Saunders. Bush vigorous; strong, hardy; fruit medium; color black; quality very good; yield 7 ounces.

Versailles. Bush partly vigorous, hardy; was attacked with blight; fruit large; color red; quality good; yield 41 ounces.

GOOSEBERRIES.

NOTES BY STANLEY SPILLETT (NANTYR, SIMCOE COUNTY).

Pearl and Downing gave a large crop (six quarts to the bush) of fine fruit, which sold readily at five cents per quart.

Twenty-five per cent. of the whole crop of Downing, Pearl, and Red Jacket fell off prematurely. The fruit commenced to fall just as the seed colored to ripen. I was in hopes last season that this falling was largely due to overloading, that the drain on the bush, just at the ripening period, was too great, but I am afraid, after this year's experience, that it is due to an insect.

Champion was fit to use green again fully two weeks earlier than Downing. This variety gave seven quarts to the bush; it runs small on old wood.

Red Jacket gave four quarts to the bush, of splendid fruit, which sold readily when ripe at six cents per quart. Though not so large as Whitesmith, it is, when ripe, or nearly ripe, the most beautiful gooseberry in my collection. I have to explain that I pruned Red Jacket and Downing very severely, both last fall and this spring, to prevent the fruit falling, which it did not do, as there was not wood enough left for a big crop of fruit. In my opinion this berry has no peer, where the gooseberry is used when ripe, or just when the berry commences to color. At this stage the berry is a pinkish transparent color, very beautiful. After ten years' experience with this variety, I have to say I am digging out everything else, except for experimental purposes, and putting in Red Jacket for market. Downing, Pearl, Champion, and Red Jacket had not a speck of mildew this season, upon either fruit or foliage.

The fruit of the foreign varieties, and their seedlings, was not affected by mildew, but the foliage was so badly mildewed that it all fell off. The mildew made its appearance on the 16th of June, and in two weeks the stems were bare of leaves, so the fruit never ripened properly, and was not fit for use.

Autocrat gave the largest crop of fruit, of the foreign varieties. The berry is very large, but of poor quality.

Large Golden Prolific, Columbia, Whitesmith, Chautauqua, Queen, and Dominion, bore a large crop of fruit, and are very much alike in fruit and bush. All mildewed, as I have described.

Crown Bob, and Keepsake were well loaded with very large berries; so was Crosby's Seedling, and Lancashire Lad. Crosby's Seedling gave the largest berries this season.

Green Chisel was loaded, but the fruit is poor in quality. All the other pure English varieties, sent to the station in 1896, have gradually died out, till now; out of six each of 50 varieties, I have, besides Green Chisel, only a dozen small, stunted bushes.

Success is identical with Downing, and Oregon Jumbo with Red Jacket.

Golden Prolific and Keen's Seedling are worthless.

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Ontario is a beautiful, large berry, and the bush is very vigorous for a foreign seedling. Yellow Scotch is not up to Whitesmith. Taken all around, I find Whitesmith the best foreign variety. The bush is a good grower.

In conclusion, I desire to give reasons why I consider Pearl and Red Jacket superior to any of the foreign varieties or their seedlings for general planting in this country :

(1) They are more vigorous, and grow lots of wood for renewing, and to stand the winter. (2) They are not affected by the mildew fungus. (3) They are great croppers. (4) They are thin-skinned, and can, therefore, be allowed to get ripe, and the skin is not disagreeable when cooked. (5) They are large enough for all practical purposes, and of the very best quality. The Pearl, for those who prefer a sweet fruit. The Red Jacket is quite tart when ripe, and larger, and looks better in the baskets than the green berry.

To those who have soil and climate favorable to the growth of the foreign varieties, I say, do not send to Britain for plants, but use those already acclimatized, such as Whitesmith. I have found the Old Country plants utterly lacking in vigor. A gentleman three miles south of my place has grown Industry for years, and has yet to see the first speck of mildew, while Industry with me never fails to rot with mildew, so there are places in Ontario favorable for their growth.

Green Chisel has succeeded the best of any variety received here from the Old Land, and yet, after ten years, the bushes are no larger than Pearl at three years from sucker.

Notes by Charles Young (Algoma Fruit Station)

Gooseberries have all done well ; Pearl is, perhaps, the best ; the berries are larger than the Downing, but both are good, and, although the English gooseberry is free from mildew here, the former are to be recommended as best for this district. Nine varieties are under test.

GRAPES.

Notes by M. Pettit (Wentworth Station).

Another season's experience with the grapes planted at this station is still more convincing that not one of the 140 varieties that have been fairly tested here can be as profitably grown as the ordinary kinds that are generally planted for market purposes, such as Champion, Worden, Moore's Diamond, Lindley, Delaware, Niagara, Concord, Wilder (Rogers' No. 4), Requa (Rogers' No. 28), Barry (Rogers' No. 43), Herbert (Rogers' No. 44), Agawam (Rogers' No. 15), and Catawba. This list covers the entire season with very good, hardy, productive varieties, and, I think, there is little, if any, profit in adding more kinds that are not as hardy or productive, and very little, if any, better in flavor or appearance. Campbell's Early might be added ; its chief value, like the Champion, is its earliness, and Vergennes because it is a good, late-keeping winter grape.

To grow grapes of fine sample, and good quality, the first and most important thing is short pruning, to prevent overloading. The next is to apply sulphur about the last week of June or first of July, to prevent mildew, and the next is to allow them to fully ripen before they are picked.

If all grape growers would comply with these conditions, the market for grapes would require one-half more than it does at present, and at higher prices.

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NOTES BY CHARLES YOUNG (ALGOMA FRUIT STATION).

Grapes are only to be planted here for amusement ; there is no profit, and but little pleasure, in trying to grow them.

PEACHES.

NOTES BY W. W. HILBORN (SOUTHWESTERN FRUIT STATION).

Peaches have been above an average crop, but, on account of the cold, wet summer, the quality was not up to the usual standard. Monilia was very prevalent, and destroyed a larger percentage than in former years. Even Smock was badly affected, a sort that is not often injured by this disease. All varieties suffered more or less, depending largely on the condition of the weather just previous to and during the ripening period. "Curl leaf" did considerable injury to most varieties that were not sprayed. We had conclusive evidence that early spraying with Bordeaux mixture will, if properly done, prevent "curl leaf." Perhaps no other sort is more susceptible to this disease than Elberta ; a number of trees of this sort were treated, the last week in March, with one thorough spraying, and the foliage was perfect. A few rods away a few trees were left without spraying, and they were badly affected with the disease. The latter consisted of several varieties that usually do not suffer so much as Elberta. One thorough spraying, if done in March, or before the buds swell, is sufficient. Every portion of the tree must be covered with the mixture. The regular formula was used, 4-4-40.

In practice, we find it difficult to spray a tree perfectly at one operation. The wind is usually blowing when the work should be done. To overcome this difficulty, we spray on the windward side ; when the wind changes, spray the other side ; by this method every portion of the tree can be covered perfectly in two operations.

The trees planted since the "freeze-out" have not come into bearing sufficiently to report on varieties. It is becoming more and more evident every season that only the finest varieties should be planted, for, whenever there is a glut in the market, it is found that it affects the small and inferior sorts most. In fact, when such fruit is not wanted at any price, strictly first-class grades will sell at a profit. Good cultivation, systematic pruning, and thinning of the fruit must be followed, if best results are to be obtained. In selecting varieties for the market purposes, the following kinds are among the most valuable, named in their order of ripening: St. John, Bridgen or Garfield, Early Crawford, Fitzgerald, Yellow Rareripe, Engle-Mammoth, New Prolific, Elberta, Late Crawford, and Smock. For localities outside the "peach belt," where hardiness of blossom buds are of prime importance, it would be more safe to plant Crosby, Longhurst, Golden Drop, and Lemon Free.

NOTES BY W. H. DEMPSEY (BAY OF QUINTE FRUIT STATION).

I had this year a nice crop of peaches on a few varieties. Bokhara was heavily loaded. Yellow St. John had a few very large samples, and so had Fitzgerald. Triumph yielded about a basket to the tree.

PEARS.

NOTES BY A. W. PEART (BURLINGTON STATION).

There was very little pear blight this season, but the scab developed to an unusual extent in a few varieties, notably the Duchess. The Flemish Beauty is scarcely ever free from it. There was also a considerable amount of knotty, gnarled fruit, due, probably, to the bite of the curculio.

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In a general way, over-cultivation and very severe pruning seem to increase the blight, by inducing a soft, rank growth of young wood. Of varieties, the Bartlett, Clapp's Favorite, Duchess, and Idaho, appear to be most subject to this trouble. Trees have made a good growth, and are in a healthy condition.

Anjou. Planted in 1880. Tree a spreading, strong grower; vigorous, hardy, productive, stocky, and handsome. Fruit large, blunt pyriform; yellowish-green when ripe; fine texture, juicy and melting. Season, November. When picked too green, the fruit shrivels instead of ripening, to a greater degree than most pears. It is also lacking in tenacity. One of the very best export pears, and a profitable orchard variety.

Bartlett. Planted 1880. Tree an upright, moderate grower; hardy, and very productive; somewhat subject to blight; fruit large, obtuse pyriform, buttery, rich. Season, early September. With efficient cold storage, a very profitable export pear, as well as an old standard orchard variety.

Bartlett-Seckel. Planted 1898. Tree a spreading, moderate grower. No fruit yet.

Beurre Bosc. Planted 1896. Tree an upright, vigorous grower; hardy, and productive with age; fruit long pyriform, melting, and rich. Season, early October.

Beurre Gifford. Planted 1896. Tree very spreading, vigorous, hardy, and productive; fruit medium, pyriform, red blush on sunny side; juicy, melting, of fine quality. Season, early August.

Buffum. Planted 1897. A strong, upright grower; fruit small to medium, oblong obovate, slightly russet; sweet, pleasant flavor. Season, September.

Clairgeau. Planted 1896. Tree an upright, moderate grower; fruit large, pyriform, dotted with russet; juicy, sweet and perfumed. Season, November.

Clapp's Favorite. Planted 1889. Tree an upright, very vigorous grower; productive, with a tendency to blight; fruit large to very large; obovate, fine in the grain, juicy and melting. Season, last of August. One of the best early commercial pears.

Dempsey. Planted 1898. Tree an upright, moderate grower. Not fruited.

Dovenne Boussock. Planted 1896. Tree a spreading, moderate grower; fruit large, roundish, pyriform, mantled with russet. Season, early September.

Duchess. Planted 1889. Grown here chiefly as a dwarf. Tree upright, only a moderate grower; fruit large to very large, oblong obovate, coarse, thick-skinned, but juicy and excellent. Season, October. One of the best export pears. Should be well cared for when grown as a dwarf.

Easter Beurre. Planted 1897. Tree spreading, very vigorous, and sturdy, branches somewhat straggling; fruit large, roundish ovate, russet dots, very solid and heavy, fine grained, rich, and juicy. Season, winter.

Flemish Beauty. Planted 1880. Tree spreading, vigorous, hardy, and very productive; fruit large, roundish, pyriform, mottled with russet; juicy, sweet, rich, but very subject to the scab, and hence almost useless. Season, early September.

Howell. Planted 1896. Tree upright, vigorous, and productive; fruit medium to large, roundish pyriform, juicy and melting; smooth-skinned, and fine in grain. Season, late October and November.

Idaho. Planted 1896. Tree an upright, light grower; subject to blight. No fruit yet.

Josephine de Malines. Planted 1896. Tree spreading, moderate vigor; fruit conical obovate, melting, sweet, fine skin. Season, early winter.

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Kieffer. Planted 1899. Tree an upright, strong, very vigorous grower when young, hardy, and very productive; fruit medium to large, ovate pyriform, slightly coarse; when fully ripe, melting, very juicy, with a decided quince flavor. Season, late October, November. A valuable export pear, very variable in size, and well adapted to lighter soils.

Lawrence. Planted 1896. Tree a spreading, vigorous grower; fruit medium, obtuse pyriform, yellow, with some russet; juicy, sweet. Season, early winter.

Lawson. Planted 1896. Tree upright, moderately vigorous. No fruit yet.

Lincoln. Planted 1898. Tree upright, moderately vigorous. Not fruited.

Louise Bonne. Planted 1897. Tree a spreading, moderate grower; fruit medium to large, long pyriform, greenish-yellow, mantled with brownish red; melting, rich, vinous. Season, late September, early October.

Osband's Summer. Planted 1897. Tree somewhat spreading, moderately vigorous; fruit medium, obtuse pyriform. Season, August. Bears early and freely.

Petite Marguerite. Planted 1896. Tree upright, vigorous; fruit small to medium, obovate, melting, juicy and agreeable. Season, late August.

President Drouard. Planted 1897. Tree a spreading, moderate grower; fruit medium, pyriform obovate, with collar at stem end. Season, mid-autumn.

Seckel. Planted 1897. Tree spreading, compact top, moderate grower; fruit small, roundish oval, russet cheek, buttery, rich, aromatic. Season, late September.

Sheldon. Planted 1889. Tree strong, vigorous, upright; fruit medium, roundish, obovate russet, melting, vinous, sweet. Season, October. A pear of excellent quality, but will not stand export.

Souvenir de Congres. Planted 1896. Tree upright, fairly vigorous; fruit large to very large, shaped something like the Bartlett; quality good. Season, late August to early September. A large, fine pear.

Sudduth. Planted 1897. Tree spreading, vigorous; fruit small to medium ovate round, thick in skin; soft, coarse flesh. Season, October.

Summer Doyenne. Planted 1896. Tree upright, vigorous; fruit small, roundish conical; melting, sweet. Season, early August.

Tyson. Planted 1897. Tree upright, vigorous, growthy. No fruit yet.

Vermont Beauty. Planted 1896. Tree spreading, vigorous, and shapely in appearance. Not fruited.

Wilder. Planted 1896. Tree upright, vigorous, growthy; fruit obovate conical, medium size; rich, sweet. Season, middle of August.

Winter Nelis. Planted 1896. Tree a spreading, straggling, light grower; fruit small to medium, roundish obovate; russet skin, fine grained; juicy, very rich and sweet. Season, December.

The French pears planted in 1900 are all growing well. So far they are hardy. Bergamotte, Esperen, Bonne de Malines, Triumphe de Jedoigne, Souvenir de la Salle, Citron Des Carmes, Olivier, and Figue D' Alencon, have made the most wood.

NOTES BY W. H. DEMPSEY (BAY OF QUINTE FRUIT STATION).

Pears have not come into bearing as soon as I expected they would. Kieffer has borne the last two years a bushel to the tree, of medium sized pears. Summer Doyenne, about a peck, very early, of no value here. Duchess precoce, a peck, similar in form to Bartlett, and nearly of the same season, not nearly as good.

Manning's Elizabeth, one peck to the tree, a nice summer pear. Dr. Jules Guyot has fruited every year since the second year after planting; very much like the Bartlett; it would be a profitable pear to grow. Andres des Portes,

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one peck to the tree; ripened the middle of August, but rotted at the core before maturity. Lincoln has borne a few small pears for the last two years; ripens in September.

Idaho was top grafted in 1895; has fruited very well for the last three years; ripens in October; is of very good quality; the tree has been healthy so far.

NOTES BY HAROLD JONES (ST. LAWRENCE FRUIT STATION.)

Pears this year are succeeding much better with me than plums. I have had no sunscald, blight, or injury from last winter. The trees have made a strong, vigorous growth, and the wood is well ripened for the coming winter. Th following varieties fruited with me this year;

Bessemianka (Russian). Planted 1897. Tree a strong, spreading grower; blighted some in 1901; bloomed profusely; set a fair crop of fruit; fruit 2 x 2 1-8 inches; shape slightly pyriform; color greenish-yellow; quality worthless, decaying on tree before ripe; ripe September 27th.

Bergamot. Planted 1896. Tree fairly vigorous, wide spreading, drooping head; foliage light green, with a greyish cast; late bloomer; sets fruit fairly well; fruit small, 1 1-2 x 1 3-4 inches; shape obovate; color dull yellow; quality medium; stem is set in shouldered cavity; ripe about October 5th; yield about twenty fruits.

Dempsey. Planted in 1896; tree, vigorous grower, upright, healthy, compact head; five fruits only fairly well grown; ripened in October.

Flemish Beauty. Planted in 1896; tree, healthy and vigorous, upright, spreading head: the fruit and foliage are both subject to spot but are easily controlled by from two to three sprayings; fruit, large in size, matured perfectly; ripe about October 15th. This pear is very desirable and will probably grow to greater perfection in both size and quality than any variety I have yet fruited.

Howell. Planted 1896; tree, vigorous grower, upright, spreading head; foliage dark green and healthy; shows some blight, but fairly hardy; yield, ten fruits, well grown.

Kieffer's Hybrid. Tree, a strong, vigorous, healthy, upright grower; early and heavy bearer; fruit, medium to large and of fair quality if picked early in October and allowed to ripen in the dark. This variety is very desirable.

Ritson. Planted 1894; tree, upright, healthy and vigorous grower, slow to come into bearing; fruit, small 2 1-8 x 2 3-8; color, russet; quality, good; ripe October 15th. This is probably a desirable variety.

Winter Pear. (Russian.) Tree, a hardy, vigorous, upright grower; fruit, medium sized and worthless, decaying on the trees before ripening.

NOTES BY W. W. HILBORN (SOUTH WESTERN FRUIT STATION.)

Pears have been a large crop, but so low in price that there was no profit left for the grower. Kieffer produced wonderfully, but the demand was not equal to the supply. They have been sold in some cases at 10 cents to 15 cents per 12-quart basket. We find them very good for canning purposes when well grown and properly ripened. When their value is known for this purpose by the general public, no doubt the demand for them will increase to a considerable extent.

NOTE BY CHARLES YOUNG (ALGOMA FRUIT STATION).

Pears planted in 1899 so far have not proved very satisfactory, although no losses occurred last year, except that two trees were girdled by mice, which

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Number.	Varieties.	Age.	Vigor. In. of growth.	Vigor. Scale 1-10.	Productiveness. Yield in quarts, per tree.	Productiveness. Scale 1-10.	Season. First and last	Remarks.
	Asperen	5	8	....	3 quarts	Too small	Winter	No good.
	Bartlett	6	28	....	6 "	....	Sept	Fine fruit.
x	Bartlett Seckel	6	25	....	30 samples	Large	Sept. and Oct.	Not equal to Bartlett; coarse.
	Belle Lucrative	6	20	....	12 quarts	"	Oct. and Nov.	Large fine fruit.
	Comice	5	15	....	8 "	Medium	Fall	A nice, smooth pear, good.
	Clairgeau	5	22	....	3 "	Large	Late fall	A very fine late pear, large.
	Clapp's Favorite	5	30	....	8 "	"	August	A good early pear.
	Dorset	5	20	....	8 "	Medium to large	November	A fine dark pear, good bearer and quality.
	Duchess precoce	5	18	....	12 "	"	October	Very heavy bearer, good and clean.
	Duchess de Bordeaux	5	22	...	3 "	"	November	A good late variety, juicy.
	Dempsey	6	28	....	10 "	Large	Nov. and Dec.	One of the best new sorts.
x	Doyenne D'Ete	6	30	....	18 "	Small	July and Aug	Too small for commercial purposes.
	Dr. Jules Guyot	6	25	....	20 "	Large	Fall	Equal to Bartlett or better
	Easter Beurre	6	20	....	5 "	"	Winter	Only fair quality.
	Fertility	5	18	....	12 "	Small	Fall	A beautiful small pear.
	Goodall	6	18	....	6 "	Large	Oct. to Jan.	A fine profitable pear.
	Garber	5	22	....	12 "	Medium	"	A promising variety.
	Howell	6	24	....	8 "	7	September	A good variety.
	Idaho	6	20	...	14 "	8	November	Good bearer, poor quality.
x	Indian Queen	5	25	....	6 "	4	October	Too small, very smooth, fair quality.
x	Japan Golden Russet	5	30	....	12 "	5	Jan. and June	Fine for ornament but good for little else.
	Koonce	5	28	....	8 "	6	November	Good yielder.
	Krull	5	24	....	10 "	6	"	Much like Keiffer.
	Keiffer	5	35	....	½ bushel	7	Nov. to Dec.	Very heavy bearer, profitable, poor quality.
	Lawson	6	36	....	12 "	6	July and Aug.	Fine showy early pear.
	LaLectier	6	14	....	8 "	5	Oct. and Nov.	Medium quality.
x	Lincoln	5	20	....	5 samples	6	October	Not attractive.
x	Lincoln Coreless	5	18	....	6 "	5	"	Not a showy kind.
x	Madam Hemingway	5	20	....	20 "	4	"	Not encouraging.
x	Petite Marguerite	6	22	...	4 quarts	5	September	Of little account here.
	President Drouard	6	13	.. .	10 "	6	Jan. and April	A good keeper, of fair quality.
x	P. Barry	5	17	....	3 "	4	Late	A poor variety here.
	Pitmaston Duchess	5	15	....	3 "	5	"	A good quality, small.
	Rutter	5	24	....	12 "	7	Nov. and Dec.	Fine large green pear of good quality.
	Ritson	6	28	....	3 "	5	October	Very hardy and thrifty.
	Seneca	5	20	....	8 "	7	Sept. and Oct.	A promising variety.
	Seckel	5	12	...	4 quarts	2	October	Excellent quality, small.
	Sheldon	5	28	..	10 samples	5	September	Good quality.
x	Tyson	6	20	....	3 "	4	"	Not profitable.
	Wilder	6	20		12 quarts	5	August	A hardy variety, good.

Those marked x I would recommend to be top grafted.

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were very bad last winter. One small specimen, Kieffer, is all the fruit so far. Flemish Beauty is perhaps to be recommended. The Russians have made a very heavy growth, two years planted, and if the fruit is only fair, are to be recommended.

PLUMS.

NOTES BY W H. DEMPSEY (BAY OF QUINTE FRUIT STATION).

Plums planted in 1895 have not done much yet; many of them have only shown a few blossoms as yet.

Victoria, only two or three samples this year; fruit large; ripened in September.

Wild Goose, vigorous grower, a dozen small red plums this year; of no value here.

De Soto made good growth, and gave a heavy crop, but not one sample ripened; all rotted. Willard fruited abundantly, but all were lost through rot.

Abundance has not been a very abundant bearer yet; only a few samples. The tree has been killed back each winter until last year. Wickson was killed back each year; only three samples as yet; fair quality. None of the prunes have fruited yet, they have a few weak blooms on each year.

Richard Trotter fruits each year and each alternate year has a good crop; fruit above medium oblong oval; skin a light reddish purple with a thin bloom; flesh, yellow, juicy, sweet, with a pleasant flavor; season, September; I consider this one of the best I have.

Saunders (Hastings Co.) Tree a strong grower, fruits nearly every year, quite abundantly; fruit above medium size, oblong oval; skin clear, yellow with a whitish bloom; flesh yellow, juicy, sprightly; ripens early in August.

NOTES BY JOHN MITCHELL (GEORGIAN BAY FRUIT STATION).

Japan Plums. Would that these plums had the quality of the Europeans. I could then recommend them without hesitation. Their hardiness is now firmly established, and they are exceedingly strong growers, wonderfully productive, and strikingly handsome and attractive. The following are the best we have in test:

Abundance has borne another heavy crop. Tree a strong and upright grower; fruit, large and very beautiful; color, yellow or amber, overlaid on the sunny side with dots and splashes of red; flesh extremely juicy, with a peculiar, sweet, delicious, mellow flavor; too juicy for a good shipper. Ripe ten days before Lombard.

Burbank, one of the strongest, but the most spreading and sprawling grower on the plantation. It is wonderfully productive, but to produce the finest fruit the tree should be severely thinned. The quality is fairly good, while its attractive color, large size, and good shipping quality, should recommend it as one of the best of the Japans. Ripe a few days after Abundance.

Red June, the earliest plum we have; also the most desirable of the Japanese varieties. Tree, a strong grower, forming a large, well-shaped top. bears the third year and abundantly; fruit, medium to large; color, bright red; conical in shape; quality good. Season about August 1st.

Orient, a very handsome symmetrical grower, and fairly vigorous. Fruit about as large as Burbank, and resembles that variety very much. September.

Chabot, a very strong grower, forming a most beautiful and symmetrical top; bears the third year; fruit about the same size and shape as Red June, but

not quite as conical. Skin amber, and well covered with splashes and markings of red; quite attractive; quality about the best of the Japans. A regular and abundant bearer. Trees six years old average this season 11 twelve-quart baskets each of marketable fruit.

Hales' Japan, a handsome upright tree; fruit, larger than medium; color, creamy yellow, well splashed with red and covered with a very beautiful light bloom, making it most attractive; flesh, light yellow, very juicy and agreeable in flavor. A good desert plum. Early September.

Satsuma or Blood, a most remarkable plum. Tree a very strong spreading grower, like Burbank, but not so sprawling; also a great bearer; fruit, if not too heavily loaded, will be large; color a dark maroon red, covered with a light bloom; flesh, blood red, resembling wounded and bleeding flesh; quality very good when fully ripe. Season, middle of September.

Blood No. 4, the same as Satsuma, except that the fruit is uniformly smaller in size.

Wickson. Tree, a slender and very close and upright grower; appears to be rather delicate in foliage; fruit of the largest size, 2 3-8 in. long, 2 in. wide; conical, slightly heavy on one side; suture, distinct; stem stout, 5-8 in. long, set in a narrow, deep cavity; flesh, yellow, slightly coarse, juicy, with a sweet and pleasant flavor; stone almost free, sometimes quite free; quality, almost best; good for desert or cooking. This is, I believe, without doubt the best quality of all the Japans. Should it prove hardy it will be a great acquisition. Season, middle of September.

Hybrid Plums.

Gold. This is one of Mr. Luther Burbank's hybrids, a cross between the wild red and a Japan plum, and it is certainly a most striking combination of the two families. The trunk is gnarled with hollows and bulges, as though the more vigorous Japan nature were trying to overcome the slower growing native. It is moderately vigorous, the leaves and branches showing strongly the characteristics of both parents. It is proving a good bearer of the most handsome, even-sized fruit; to use Mr. Burbank's own words: "Nothing on earth so beautiful or good." It certainly was the most beautiful, both on the tree and in the basket of anything on the grounds this season, and that includes 120 bearing varieties. Fruit, above medium, nearly round; size 1 3-4 in. by 1 3-4 in., often larger; color, a rich golden yellow, lightly but beautifully shaded with red; flesh, yellow, not coarse, juicy, good; stem, slender, 5-8 in. long, set in a wide but not deep cavity; suture, only a line; stone, small, semi-cling. This is a most remarkable new plum. Its record will be noted again.

Notes by A. E. Sherrington (Lake Huron Fruit Station).

Abundnace. Tree, vigorous and hardy; fruit, large; color, reddish purple; quality, good; yield per tree, two baskets, last year ten baskets; date of blooming, May 16th; ripe August 25th; seven years old.

Burbank. Tree, sprawling, vigorous and hardy; fruit, large, one and a half in. by one and three-quarters; color, red, resembles Abundance; quality good; did not fruit this season; yield, last year nine baskets.

Bradshaw. Tree, upright and spreading, hardy and vigorous; fruit, very large, two and a half in. by two; color, purple; quality, good; bloomed, May 16th; ripe, Sept. 10th; yield, two baskets; last year one-half basket; four years old.

Golden Drop. Tree, strong, vigorous and hardy; fruit, two by one and a half inches; quality, medium; color, yellow or light green; bloomed, May 17th;

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yield, six baskets; last year two baskets; ripe, September 29th. Six years old.

Duane's Purple. Tree, vigorous and hardy; fruit, large, one and three-quarter in. by one and three-quarters; color, purple; quality, good; bloomed, May 16th; ripe, September 15th; yield, three-quarters of a basket; last year one basket.

Field. Tree, vigorous and hardy; fruit, large, two in. by one and five-eighths; color, purple; quality, good; bloomed, May 17th; ripe, September 8th; yield, three-quarters basket; last year, one-half basket; five years old.

Guii. Tree, vigorous and hardy; fruit, large, one and three-quarter in. by one and a half; color, dark purple; quality, best; bloomed, May 16th; ripe, September 8th; yield, one and three-quarters baskets; last year one and a half baskets.

Grand Duke. Tree, strong grower, hardy; fruit large, two by one and a half, with heavy bloom; quality, good; a fine shipping plum; bloomed May 16th; ripe, September 29th; yield, three baskets; last year one and a half baskets.

Gold. Tree, poor grower; fruit, small to medium; color, yellow, turning red at maturity; quality poor; bloomed, May 19th; yield, two quarts; last year about the same.

Hale. Tree, vigorous and hardy; fruit, large, one and three-quarters by two inches; quality, good; first class for dessert; color, yellow; bloomed, May 16th; ripe, September 10th; yield, three baskets; last year three baskets.

Hugh's Seedling. Tree, upright grower, hardy and vigorous; fruit medium to large, resembles yellow egg, but quality not so good; bloomed, May 17th; yield, one basket; ripe, October 1st.

Imperial Gage. Tree, forming a compact head, vigorous and hardy; fruit, medium size, one and a quarter in. by one and five-eighths; color, yellow; quality, best; bloomed, May 17th; ripe, September 10th; yield, five and two-thirds baskets; yield last year two baskets; one of the best of the light colored varieties.

Lombard. This is an old and valuable plum, but is being displaced by newer and better sorts, owing to its liability to being attacked by the black knot and plum rot. Tree, vigorous and hardy, inclined to overbear itself, needs thinning to give best results; fruit, medium, size one and a half by one and a half; color, reddish purple; bloomed, May 18th; ripe, September 22nd; yield, two and a half baskets; last year, six and a quarter baskets; seven years old; quality good.

Monarch. Tree, vigorous and hardy, early bearer, and productive; fruit, large, one and three-quarter in. by one and three-quarters; color, purple, with heavy bloom; bloomed, May 16th; ripe, September 29th; yield, four and one-third baskets; last year, two and three-quarter baskets; five years old; quality good.

Moore's Arctic. Tree, is a vigorous grower and hardy, and an early bearer; fruit, medium; color, purple, becoming almost black, when fully ripe; bloomed, May 19th; ripe, September, 4th; yield, six baskets, last year eight and a half baskets.

McLaughlin. Tree, good grower, early and annual bearer; fruit, yellow with reddish dots; quality of the best; medium to large, one and a half by one and a half; bloomed, May 16th; ripe, September 16th; yield, two baskets; a good one.

Pond's Seedling. Tree, an upright grower, vigorous and hardy; fruit, very large; color, reddish purple; bloomed, May 19th; yield, one-quarter basket; last year half a basket; five years old; very subject to rot.

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Purple Egg. Tree, a good vigorous grower, hardy; fruit, large; color, purple; quality good; bloomed, May 18th; ripe, September 20th; yield, two and a half baskets; last year two baskets; five years old.

Quackenbos. Tree, vigorous and hardy; fruit, very large, two in. by one and a quarter; color, dark blue; quality very good; bloomed, May 16th; ripe, September 16th; yield, two baskets; last year, one and a half baskets.

Red June. Tree is strong and vigorous grower, hardy and productive; fruit, large, one and three quarters by one and a half; bloomed, May 10th; ripe, August 20th; yield, small, as we had a heavy frost when in bloom; this is the earliest plum we have and the quality is good.

Spaulding. Tree, vigorous and hardy; fruit, medium; one in. by one and a quarter; color, greenish yellow; quality, good; flavor, very sweet; bloomed, May 16th; ripe, September 6th; yield, five baskets; last year, six baskets.

Shipper's Pride. Tree, upright, strong and vigorous grower; fruit, large, one and a half in. by one and a half; color, purple; quality very good; bloomed, May 19th; ripe, September 17th; yield, two baskets; last year, two baskets; a good shipper.

Satsuma. A strong vigorous grower, hardy; fruit, large, one and three-eighths in. by one and three-eighths; color, very dark; flesh, the color of a blood beet but quality first class for canning; bloomed, May 19th; ripe, September 22nd; yield, seven and three-quarters baskets; last year, two baskets; this is a valuable plum of the Japan variety.

Victoria. Tree, vigorous and hardy; fruit, large, two by one and three-quaters; color, yellowish, turning red or mottled when fully ripe; bloomed, May 17th; ripe, September 8th; yield, two baskets; last year, six baskets; a very fine plum.

Washington. Tree, a good grower, hardy; fruit, large, two in. by two inches; of the best quality; color, yellow; bloomed, May 16th; ripe, September 5th; yield, one basket; last year, 4 baskets.

Wickson. An upright grower, forming a close head, rather tender; fruit very large, two and a quarter by two; quality, fair; yield, one basket.

Yellow Egg. Tree, a good vigorous growth, hardy; large size, two by one and a half; ripe, September 29th; yield, three baskets.

Notes by G. C. Caston (Simcoe Fruit Station).

Plums were a failure, but few varieties produced any fruit. We have from 400 to 500 trees grown to bearing age, comprising most of the commercial sorts. Bradshaw took the lead and produced about one-fourth of a crop. Imperial Gage and Monarch were next in productiveness. All other kinds failed to produce more than a few specimens on a small proportion of the trees. None of the Japan varieties produced a crop.

My experience with plums goes to show that two or three of the Japan varieties suit this section better than any. The European varieties are very uncertain. The most of them are very short lived. They will produce a few good crops and then fail, while twenty miles northwest of here, around the shores of the Georgian Bay, all kinds of plums flourish, better perhaps than in any other part of the Province. I have tested here about forty varieties of European plums, and I would not feel justified in recommending any of them as likely to give profitable results in this section. Of the Japan plums that I have tested I would narrow down to three: Abundance, Burbank and Red June. These, though not up to the European varieties in quality, produce fruit that sells well and seems to suit the taste of most customers for canning purposes. The trees are seemingly quite hardy, and instead of failing like the European varieties, rather seem to improve as they grow older.

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I have a small plum, the scions of which I got from Prof. Craig at Ottawa some years ago, under the name of Early Botan. It is top-worked on native stock, and bears heavy crop. It comes in two or three weeks ahead of any other plum. It falls from the tree before quite ripe, but will ripen perfectly after. It is rather small, but has a very small pit. It is covered with a pink bloom; quality first rate with a delightful aroma. It seems to suit this section well, the defect being its small size.

NOTES BY CHARLES YOUNG (ALGOMA FRUIT STATION).

Plums have all done well and made a very satisfactory growth, but for the north and on heavy clay I would most emphatically say plant Japans, they are away ahead of all others. All I have tested, except Wickson, have proved quite hardy, and most of them have fruited. The following are especially to be recommended: Ogon, quality fair; Burbank, quality very good, but a very straggling grower and requires cutting back to keep it in shape; does not make as handsome a tree as the former, but the fruit is better, although not quite as fine in appearance; Willard, quality poor, but very early, habit of growth good, appearance good; Reine Claude, good all round; Lombard, fruited, but not very satisfactory; Moore's Arctic bore a few plums; of the Americana class there is not much to say in favor; they lack toughness of wood which is against them; half the top wil break off with its own weight. All those planted in 1899 have fruited this year, but none of them of good quality; when Japans can be grown so well they are not to be recommended. America is the tenderest plum I have grown; it is killed back every year.

NOTES BY W. W. HILBORN SOUTHWESTERN STATION).

Plums were a failure; but few varieties produced any fruit. We have from 400 to 500 trees grown to bearing age, comprising mostly of the commercial varieties. Bradshaw took the lead, and produced about one-fourth of a crop. Imperial Gage and Monarch were next in productiveness. All other kinds failed to produce more than a few specimens on a small proportion of the trees. Nine of the Japan varieties produced a crop.

NOTES BY HAROLD JONES (ST. LAWRENCE FRUIT STATION).

European plums are not at all satisfactory. There will be very few, if any, that will bear annually and many varieties are entire failures. Of those planted in 1896, Grand Duke, Coe's Violet, Emerald, Muir, and Pond's Seedling are dead, and Yellow Egg, Green Gage, Prince of Wales, Lincoln, Hugh's and Montreal are more or less injured and likely to die. The most healthy trees that I have are Lombard, Guii, Saunders, and Glass Seedling. These so far, are healthy, both in limb and foliage, but bear very little fruit. This year there are no European plums whatever.

The Japanese plums are doing better with me than the European, and all varieties planted are healthy and doing well. The blossom buds were nearly all injured last winter. Some fruit set on the Gold and the Abundance, and I had one plum on the Wickson, which was planted in 1900. The foliage of these trees is freer from fungus attacks and aphis than any of the European varieties, and the later blooming varieties may prove with us more valuable than the European.

So far as tested the American plums will be the ones upon which we shall have to depend as sure croppers. Some of the varieties of this class are of very good quality and have ready sale at fair prices in some of our eastern markets, particularly the later varieties, that come in after the main

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crop from the western part of the Province. The season extends from early in August until October.

The following is a list of some of the varieties that fruited this year :

Charles Downing. Planted in 1896. Tree, slow grower with a spreading to drooping head ; foliage very subject to plum pocket and attacks by aphis; shy, late bloomer; sets fruit poorly. This seems to be an undesirable variety.

Col. Wilder (Americana). Planted 1897. Tree moderately vigorous, hardy, wide-spreading head, moderate bearer ; foliage, light green, healthy, subject to attacks by aphis; fruit, size, 1 x 1-16; color, dark red; skin thick; flesh, fibrous and soft; quality, poor to fair; stone, small and cling.

Forest Rose. Planted 1897. Tree, rapid grower, spreading, liable to split and break down with the wind; fruit, in size, color and quality, similar to the Hammer; ripe, October 1st to 5th; yield, one-half twelve-quart baskets per tree.

Hammer (Chickasaw.) Planted 1896. Tree, strong, healthy and vigorous, round compact head, hardy; foliage, dull green, free from shothole fungus, very subject to attacks from aphis ; profuse, early bloomer ; sets fruit well; fruit, size, 1 1-8 x 1 1-8 inches; skin, dull red; covered with whitish dots; tough and thick; quality, fair to good; flesh, tough, sweet and juicy; and skin liable to crack when ripening ; stone small cling ; ripe October 1st to 6th ; yield, two twelve-quart baskets to the tree.

Milton (Chickasaw). Planted 1896. Tree, vigorous grower, hardy, compact spreading head; foliage light green and healthy, sometimes attacked with plum pocket, free from shothole fungus, but subject to attack from aphis; late bloomer; sets fruit well; fruit, 1 1-16 x 1 1-8; color, purplish red, covered with grey specks or dots ; skin, rather tough ; quality poor to medium; flesh yellow and soft; stone, medium cling; ripe, August 25th; yield, one and one-half twelve-quart baskets to the tree.

Weaver. Planted 1896. Tree, rapid grower, sprawling uneven head, not very healthy ; a few limbs dying every year ; early profuse bloomer ; sets very little, if any, fruit. This variety has so far proved of very little value.

Whitaker (Chickasaw). Planted 1896. Tree, a rapid grower, hardy, a wide spreading head; foliage, bright green and glossy; free from shothole and other fungous diseases; late bloomer; fruit 1 1-8 x 1 1-4 inches; skin, thin, tender, bright glossy red; quality, good; flesh, light yellow, tender and juicy; stone, small and semi-cling; ripens rather unevenly from 1st to 10th of September. Yield of two twelve-quart baskets from trees planted in 1897. Of all the varieties of this class, which have fruited, I consider this the best.

RASPBERRIES.

NOTES BY A. E. SHERRINGTON (LAKE HURON FRUIT STATION).

Yield from the raspberry plantation will be small this season, owing to the new plantation being used for experimental purposes ; besides, some of the varieties did not do well the previous year.

Brandywine. A poor grower ; canes small, has not sufficient vigor to make a profitable variety ; fruit small ; quality very good, soft ; color red ; ripe July 18th ; last picking August 2nd ; yield 7 ounces.

Conrath. Plant strong, vigorous, healthy, hardy ; fruit large and firm : quality good ; color black ; ripe July 22nd ; last picking August 2nd ; yield 18 ounces. One of the best.

Cuthbert. A very strong, vigorous grower ; not as hardy as some, but

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is seldom destroyed by the frost; fruit very large; color red; quality best; yield 96 ounces. This is the best medium to late variety grown.

Columbian. Plant strong, vigorous, healthy; not hardy; fruit large; color purple; quality very good; yield 272 ounces; first picking July 26th, last picking August 16th.

Hilborn. Plant vigorous; healthy and hardy; fruit large and firm; quality of the best; color black; ripe July 13th; yield 65 ounces. This is one of the best of the black caps.

Kansas. Partly vigorous, but not as hardy as it ought to be; fruit large, black; quality good; ripe July 22nd; yield 32 ounces.

Marlboro. Canes strong, but not vigorous enough; healthy and hardy; fruit large and firm; quality fair; ripe July 18th; yield 41 ounces.

Older. Not as vigorous as it might be, and the canes are weak and of a trailing habit; fruit large; quality good; ripe July 22nd; yield 9 ounces.

Phoenix. Plant fairly vigorous; healthy and hardy; fruit large, red; quality good; yield 51 ounces; a very good, late variety.

Pioneer. Plant fairly vigorous, half hardy; fruit medium; color black; quality good; yield 22 ounces; ripe July 22nd.

Golden Queen. Canes strong, vigorous and hardy; fruit large; quality good; ripe July 18th; yield 40 ounces. The best light variety.

Reliance. Plant fairly vigorous, healthy and hardy; fruit small to medium; quality good; ripe July 18th; yield 38 ounces. A good early sort.

Smith's Giant. Plant strong and vigorous, fairly hardy, and healthy; fruit very large; quality good; ripe July 22nd; yield 71 ounces. A good one.

Shaffer. Plant a vigorous grower, tender; fruit large; color purple; quality good for canning; ripe July 26th; yield 25 ounces.

Strawberry Raspberry. This variety is a great success here, and quite a demand has sprung up for it for canning purposes; plant grows about 18 inches high; fruit large, bright red; quality very poor, except when canned; ripe July 5th; yield 249 ounces from a plot of three by ten feet.

Tyler. Plant fairly vigorous, not hardy; fruit medium; quality good; ripe July 18th; yield 19 ounces.

Turner, Reliance and Marlboro are the three best early red raspberries; the Cuthbert and Phoenix are the two best medium to late; Hilborn, Conrath, and Smith's Giant are the three best black caps.

Notes by Charles Young (Algoma Fruit Station).

Raspberries. I would recommend Loudon; the fruit is no better, nor is the plant a heavier bearer than Cuthbert, but the latter freezes back considerably every year. I know of no better berry than Loudon. The Black Caps are not desirable here; the heavy weight of snow melting in spring breaks them off at the ground. Mice also have a fondness for the bark of the Black Caps in winter.

Notes by G. C. Caston (Simcoe Fruit Station).

In raspberries, the Cuthbert, notwithstanding its liability to kill back at the tips during winter, in a good season leads all others in quantity and quality. I have almost entirely discarded Black Caps. There is only a very limited demand for them, and it does not pay to grow them.

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STRAWBERRIES.

NOTES BY E. B. STEVENSON (STRAWBERRY STATION).

I will now proceed to give a short description of each variety that fruited with me :

Aroma (perfect blossom). Strong, healthy plant. One of the good late ones.

Annie Laurie (perfect). One of the best for quality ; not productive enough for market grower ; plant strong, and healthy.

August Luther (perfect). Healthy ; plant small, good runner, productive; a good early kind ; a day or so behind Michel this season; last season ripened first.

Blonde. Plant medium size ; good grower, makes wide row ; good cropper ; berries stand up above the foliage ; shape somewhat like Nick Ohmer ; plant rusts some.

Bobolink. The plant fails; not many berries, and not desirable.

Bubach No. 5 (imperfect). An old stand-by ; hard to beat for large, fine berries, and lots of them. Valuable for near market.

Bismarck (perfect). Plant healthy like its parent, the Bubach ; good grower ; berry round and large ; bright, glossy, with yellow seeds. A very good kind.

Brandywine (perfect). Rampant grower ; well known now. One of the best medium to late.

Bederwood (perfect). A good early ; grown altogher for early by some ; very productive; plant in some places rusts somewhat. A good one.

Clyde (perfect). Plant large, strong, and vigorous ; makes good row ; berry large and fairly firm ; plant very productive. One of most profitable for near market.

Challenge (perfect). Plant is healthy ; large, and strong grower, making plants freely ; the berry is large, sometimes cleft at end ; the color glossy red ; quite dark when fully ripe ; shape somewhat like the old Parker Earle, only it is flattened ; it has quite a neck and is round at the end ; the quality is the best. I should say it would prove to be a good one.

Carmi Beauty. Plant strong, vigorous grower, good plant maker, healthy, and quite productive ; berry medium sized ; somewhat irregular, does not ripen evenly, but good flavor ; roundish in shape.

Corsican (perfect). Plant very large, strong and healthy, fairly good runner ; quite productive ; it resembles the New York and Uncle Jim very much, somewhat like the Woolverton ; berry very large, good quality.

Cobden Queen (perfect). Strong flower, healthy, makes lots of plants ; light color ; leaves curl like the Greenville ; quite productive ; berry medium in size, good color, good quality, firm ; seeds prominent ; late ; worth a trial.

Downing's Bride (imperfect). A good, healthy grower, free plant maker. This variety did not do as well as usual.

Earliest (perfect). This resembles Michel so closely that I am not able to distinguish between them.

Excelsior (perfect). A good plant maker, and fairly productive for an early kind ; some grow this altogether for early, and say it is the best ; worth trying.

Eleven-fifty-nine p.m. or Midnight. This comes from a cross of Haverland and Parker Earle ; from J. H. Hale, of Connecticut. The plant is a good grower ; some traces of rust ; medium in size ; makes a fair row ; the berry is similar to Parker Earle in shape, but flattened : color light rose on upper side almost white on under side ; it is very late ; does not color well ;

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the flavor is good, but it must be eaten before it is all colored, or it will then be overripe and soft; quite productive. I do not think it will ever be in favor as a market berry.

Emperor and Empress. Very like each other; both good, strong plants; free runners, and very healthy; quite productive; both large berries; good quality; worth trying. Both did well the past season.

Gibson (perfect). Healthy plant, large and strong; very productive; berry large and very dark when ripe; does not ripen well—that is, the under side does not color well; good in shape, conical and regular; firm and of good quality; shape very like Nick Ohmer; a very dark red, almost black on upper side, and quite light on under side; except for this it would be a first-class berry.

Glen Mary (perfect). This variety is now quite widely grown, and is a favorite; plant strong and healthy; a good runner and quite productive; berry very large ribbed and green at tip; fair quality; firm, and good shipper.

Greenville (imperfect). A good grower; plant healthy; leaves curl up somewhat; very productive; a profitable variety to grow.

Haverland (imperfect). Plant strong and healthy; one of the best; very productive, in fact, may be taken as a standard of productiveness; the berry is long, large, bright, glossy, a little light in color, but attractive in the basket; a good shipper; about the same season of blooming as the Clyde.

Howard's No. 4. A seedling originated by Mr. Howard of Massachusetts. The plant is strong, healthy and quite a vigorous grower; quite productive; the berry is large; one of the largest, true conical; rich dark scarlet in color; the quality is very good; a new one, of very great promise; not yet introduced; sent me by Mr. Howard for trial; I have fruited it once; mid-season to late.

Hero (perfect). Plant a strong grower, healthy, little rust; very dark color; makes very wide row if allowed to run; one of the best plant makers; quite productive; berry large, bright red color. A good one, well worth a trial.

Honest Charlie. Sent out by Mr. Farmer of New York State; plant large, strong and healthy; stools out, makes few runners; a fine one to grow in the hill system; quite productive; berries medium in size; fine flavor.

Hunn (imperfect). A strong, vigorous grower; plant large, sometimes rusts a good deal; quite productive; late in ripening; berry large, very dark, red, with dark red seeds; roundish, firm and fine quality. A good extra late one.

Joe (perfect). One of J. H. Black's pedigree seedlings from New Jersey, sent me for trial; a very good late variety; the plant is large, healthy, fine; bright green leaves, quite free from rust; the berry is large, somewhat oval in shape, with a neck; strong fruit stems, holding the fruit well up in the foliage; the quality is very good; the plant is quite productive, not so late as Nettie and Robbie, but late; ripens with Gandy. I consider it well worth a trial by those who want late berries. It did very well with me the past season.

Jersey Queen (imperfect). The plant is small, very flat on the ground, a free runner and very healthy; fairly productive; very late in ripening its fruit; a good late variety; the fruit is large, roundish, light scarlet, with gold seeds; good quality.

Johnson's Early (perfect). The plant is only medium in size, dark green in color, a fair runner; the berry is medium in size, bright red in color; fair quality; almost as early as August Luther and Michel; is highly spoken of in some places, but has not done as well with me. It is worth a trial.

Klondike (perfect). Plant a strong, good grower; some rust; making

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plenty of runners that take root easily ; quite productive ; berry large, light scarlet ; flesh pink, medium in firmness, somewhat irregular ; yellow seeds ; large to very large, like Clyde ; quite late ; a good late variety.

Lovett (perfect). Plant a strong, healthy grower ; well known ; did not do as well as usual ; berry very like Williams and Saunders ; medium to late in season ; a good market berry. No one can go wrong in planting it ; of the three I like Saunders the best.

Leo (perfect). Healthy plant, good runner and plant maker; many others much better, so I will drop it; some think very highly of the Leo.

Lord Sheffield (perfect). A variety from England, a good early kind; good plant maker, rusts somewhat; quite productive; berry is roundly conical, bright red, large.

Marie (imperfect). From seed of Crescent, fertilized with Cumberland. Plant healthy, fair grower, makes fair row; berry large, round, somewhat irregular, scarlet, yellow seeds, solid; flesh pink, medium in firmness; somewhat sour, but spicy; worth a trial.

Margaret (perfect). Plant is a good, healthy grower, makes plants freely in rich soil, quite productive; berry large and beautiful, well worth growing if given good care.

Miller (perfect). Did well this year; plant very large and strong, healthy, no rust; berry large, conical and ribbed like Glen Mary; firm; bright red. Season medium to late; a good one.

Michel (perfect). So well known that it needs no description; did well when it was not hurt by frost, as all the first bloom was killed.

Monitor (perfect). A seedling of Crescent and Capt. Jack, from Missouri; the plant is small but a rampant grower; dark green in color, foliage glossy; stands dry weather well; the berries are large, roundish and bright scarlet; there are no small berries; the vigor of the plant is such that it is about to mature and ripen its immense crop; the flesh is firm and good flavor; taken altogether, the Monitor is one of the best, if not the best, of the late introductions; its season is from early to late; I would recommend it to sell.

Nettie (imperfect). One of Black's pedigree seedlings ; the plant is a very strong grower ; makes wide row ; productive ; the berry is very large and quite irregular, does not color up well ; color pink inside ; medium in firmness ; good quality ; acid ; very late, the latest of all ; will give further trial.

New York (perfect). Plant is large, healthy, strong grower ; makes runners freely ; the berry resembles the Woolverton ; flesh white and pink ; very large in size ; medium in firmness ; good quality ; fairly productive ; mid season.

Nick Ohmer (perfect). A good plant, healthy and vigorous; making a good stand of plants, quite productive; this season it was hurt very much here with the frost, but was uninjured at Guelph; the berry is large, very firm, conical; good quality; a favorite with us here.

Parson's Beauty (perfect). A good one; did very well this season; a beautiful berry of very good flavor; productive; worth trying.

Pride of Cumberland (perfect). This variety suffered somewhat from rust this year; the berry is large and firm and good flavor; plant productive.

Ruby (perfect). This is one of the best this year; very healthy plant; good runner; productive; berry large, conical, good looking, firm and good quality.

Rough Rider (perfect). I have tried this now for several years; am very much disappointed in it; it does not do with me at all; shall let it go.

Smith's Seedling (perfect). Very much resembles Michel's; same season but more productive; a good early.

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Saunders (perfect). Did very well this season; one of the best varieties for market growing; is becoming well known.

Seaford (imperfect). Is a good one, but it suffered from frost this year and rusted somewhat; did not do its best.

Senator Dunlap (perfect). The plant is small but deep rooted, a great plant maker, is healthy, very productive; berries large dark crimson, conical in shape, quite firm; a second early in season; will be a good market berry.

Splendid (perfect). Plant vigorous and healthy, making plants freely, quite productive; berry large, roundish, scarlet, firm; a good early market variety.

Sample (imperfect). From Massachusetts. Plant a strong, healthy grower; good runner and quite productive, free from rust; berry is large, conical fairly firm, sometimes has a neck; season middle to late; a good late variety.

Tennessee Prolific (perfect). A good market variety; did well the past season, has always done well since its introduction.

Van Deman (perfect). In some localities the only early variety; does not succeed in some places; did well here the past season.

Wm. Belt (perfect). This is a good one. Plant is strong grower sometimes rusts somewhat; the berry is large, bright red, an attractive berry; it has done well here; fairly firm and of good flavor.

Williams (perfect). Now so well known at it needs no description; did well the past season; mid season; produced some fine berries; it is grown very extensively in the Jordan section.

Woolverton (perfect). A strong healthy plant, vigorous grower, fairly productive; berry very large, conical, mild, pleasant flavor; a fancy sort.

Uncle Jim (perfect). Plant strong, vigorous and healthy; makes plants freely, very productive; berry very large; flesh white and firm, of good quality; ribbed somewhat; has a shoulder, but is large and attractive.

Yant (perfect). Plant healthy, a vigorous grower; berry, large, roundly conical, with neck; dark red; red and yellow seeds; firm and good flavor; large green hull; from one year's fruiting I should judge it a good one.

NOTES BY STANLEY SPILLETT (SOUTH SIMCOE STATION).

Williams strawberry took the lead here again this season; though I got but one picking, for a big flood destroyed the rest. I have Saunders, Sadie, Glen Mary and Clyde this season; and Van Deman, Tennessee Prolific, William Belt, Woolverton, Green's Big Berry, and Michel's Early in addition for next season.

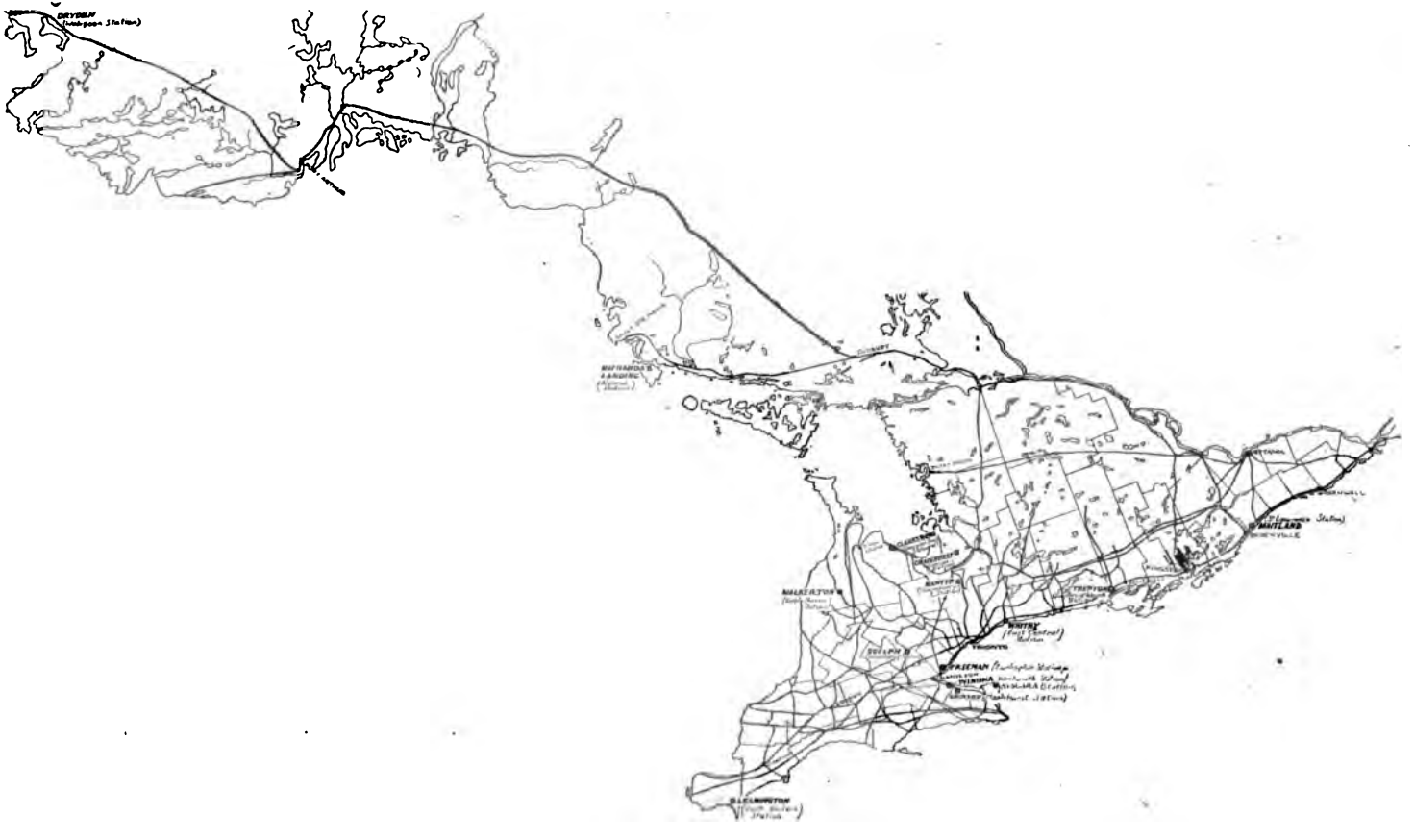
Japan plums, Willard, Abundance, Burbank, and Wickson gave just a few specimens this season, but the trees, of which there are five set, are making a phenomenal growth, and so far have not lost a shoot. I have added Red June.

I have one dozen Dyehouse cherries, five years set, which gave this year a little fruit of fine quality.

My Princess Louise apple received from the Association some years ago, gave a barrel of splendid fruit. Every one who has sampled the fruit declares it superior to the Snow; one thing is certain, the fruit is as red and much larger; as a dessert apple, I think it has few equals.

Spraying was a very difficult matter throughout the early part of the season, owing to the continuous downpour of rain, which not only washed off the Bordeaux mixture, but made it difficult to draw the cart. We had during one spraying a man at each wheel and one pulling.

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Map showing relative situations of the Ontario Fruit Experimental Stations.

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CATALOGUE

OF THE VALUES OF

THE FRUITS AND FRUIT TREES OF ONTARIO

ALSO SHOWING

THEIR ADAPTABILITY TO THE VARIOUS PARTS OF THE PROVINCE

DESIGNED TO AID PLANTERS IN SELECTING SUITABLE VARIETIES.

SUBJECT TO REVISION.

COMPILED BY THE SECRETARY OF THE FRUIT EXPERIMENT STATIONS

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CATALOGUE OF ONTARIO FRUITS.

APPLES.

Key to Quality:
1 Very Poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
8—9 Very Good.
10— First Class.

Key to Market Value:
1—3 4th Rate.
4—6 3rd Rate.
7—8 2nd Rate.
9—10 1st Rate.

Key to Stations:
1 Southwestern.
3 Wentworth.
4 Burlington.
5 Lake Huron.
6 Georgian Bay.
7 Simcoe.
8 East Central.
9 Bay of Quinte.
10 St. Lawrence.
13 The Secretary's Fruit Farm.
14 Algoma.
15 Wabigoon.

Key to Adaptation:
*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Varieties.	Tree.			Fruit.						Adaptation.											
										Southern Stations.					Middle Stations.				Northern Stations.			
	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Quality.	Value for home market.	Value for foreign market.	Season of use.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.	No. 15.
Archer	9	10	8	L	S.R	7	4	.....	Sept.	....	....	....	....	....	....	....	....	0	....	....	....	....
Andrew Sweet	9	10	7	.....	Y	6	6	.....	.....	....	....	....	....	....	....	....	....	0	....	....	....	....
Arabka	9	10	6	L	R	3	4	.....	Jan.-Feb.	....	....	....	....	....	....	....	....	0	....	....	....	....
Adams Pearmain	7	8	8	L	R	10	9	10	Jan.-Feb.	....	....	....	....	....	....	....	....	*	....	....	....	....
Albury	8	10	6	L	Y	8	4	.....	Aug.-Sept.	....	....	....	*	....	....	....	....	0	0	....	....	....
Alexander	10	10	8	L	R	7	8	8	Sept.	....	....	*	0	*	0	*	*	*	*	**	*	....
American Golden Russet	8	10	6	.....	.....	.....	7	....	Jan.-Mar.	....	....	....	*	*	*	*	**	0	*	*	....	....
American Pippin	8	9	6	M	S.R	8	8	8	April-May	....	....	....	....	....	....	....	....	0	....	....	....	....
Atonovka	8	10	7	M	Y	6	6	6	Feb.-Mar.	....	....	....	....	....	....	....	....	0	....	....	....	....
Astrachan	9	10	8	L	R	8	7	.....	August	*	....	....	*	**	0	**	*	0	0	*	*	....
Akin	9	10	9	M.L	R	8	9	9	Mar.-Apr.	....	....	....	....	....	....	....	....	**	....	....	....	....
Arabka	8	10	8	L	R	7	8	....	Feb.-Mar.	....	....	....	....	....	....	....	....	*	....	....	....	....
Arnold	8	9	9	L	Y	8	7	....	.....	....	....	....	....	....	....	....	....	0	....	....	....	....
Bailey Sweet	7	8	8	L	R	8	8	....	Dec.-Mar.	....	....	....	....	....	0	....	....	0	....	....	....	....
Baldwin	7	8	9	L	R	8	10	10	Jan.-Mar.	....	....	....	**	*	**	**	*	0	00	*	00	....
Blenheim	10	10	8	L	R	9	9	9	Nov.-Mar.	....	....	....	*	**	*	*	*	*	**	....	....	....
Bonum	8	9	8	M	R	5	8	.....	Dec.-Feb.	....	....	....	....	....	....	....	**	0	....	....	....	....
Barry	9	9	9	M	Y	5	5	.....	Jan.-Mar.	....	....	....	....	....	0	....	....	0	....	....	....	....
Baltimore	10	10	9	L	R	5	8	8	Jan.-Mar.	....	....	....	....	....	....	....	....	*	....	....	....	....
Banks' Gravenstein	10	10	8	L	R	9	9	...	Sept.	....	....	....	....	....	....	....	....	*	....	....	....	....
Blunt	10	10	8	L	R	6	7	.....	Oct.-Nov.	....	....	....	....	....	....	....	....	0	....	....	....	....
Blue Pearmain	8	10	6	.....	.....	.....	8	9	Oct.-Feb.	....	....	....	....	0	....	....	*	....	*	....	....	....
Boiken	9	10	10	L	Y	9	9	.....	Jan.-Mar.	....	....	....	....	....	....	....	....	†	....	....	....	....

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Beauty of Kent	10	10	9	L	Y	6	7		Sept.-Oct				*	*	0	*	**	0	**				
Ben Davis	8	8	10	L	R	4	9		Mar.-May				*	*	**	**		**	**	*	†		
Benoni	8	9	10	L	Y	10	7		July-Sept					*	*			*					
Benton Co. Beauty	8	9	9	L	R	6	8		Feb.-Mar									*					
Banana	9	9	10	L	Y	10	9		Jan.-Mar									*					
Barcelona Pearmain	9	9	8	M	Y.R	10	7		Mar									0					
Bethel	7	7	5	L	R	6	7		Nov								†						
Bogdanoff	10	10	8	L	Y	6	6		Nov.-Oct									0	†				
Bietigheimer																			*	*			
Bismarck	7	10	10	L	R.S	7	8		Dec.-Feb						†			†					
Borsdorf	6	9	2			1	2														0		
Brockville Beauty	10	10	9	M	R	7	6		Aug.-Sept									0	*	0			
Cabashea	10	10	5	L	R	5	6		Oct.-Dec				0	0	*	*	0	0	0				
Canada Red	7	9	8	L	R	6	8		Dec.-Mar					*				0	*				
Canada Reinette																				*			
Cayuga Red Streak	7	6	8	L	R	6	8	8	Oct.-Dec					*			**	0	*				
Canada Baldwin	7	8	8	M	R	8	8		Jan.-Feb					0				†	*				
Carolina Red June	6	7	7	M	R	8	8		Aug									†					
Carlough	8	8	8	L	Y	7			Jan.-Mar									0					
Cellini	8	8	8	L	R	6	6		Oct.-Nov									0					
Clayton	7	9	8	L	Y	8												†					
Chenango Strawberry	6	7	8	L	R	8	8		Sept.-Oct				0	*	*	*	0	0	*				
Colvert	8	10	10	L	R	7	7		Oct.-Nov				*	0	*	**	*	0	*				
Cox's Orange Pippin	6	8	9	L	R	10	10	10	Dec.-Jan									*					
Coo's River Beauty	8	9	9	L	R	8												†					
Cooper's Market	9	10	9	L	R	7	9	9	Feb.-Mar					0		*		*					
Cranberry Pippin	9	10	7	L	R	5	9	9	Dec.-Feb					**				*					
Charlamoff	6	10	7			10	10		Sept												**		
Duchess	9	10	10	L	R.S	8	10		Aug.-Sept					**	*			**			**		
Domine	9	9	9	L	R	8			March									†					
Dora	9	9	10	L	Y	8			Aug.-Sept									0					
Duffey's Seedling	9	10	10	L	R	6			Jan.-March									†					
Early Harvest	9	9	10	L	Y	8			July-Aug					*	0	0	*	*	0	0	**		
Early Joe	8	9	10	M	R	8			Sept									0					
Ella	8	9	10	L	R	8			Sept									0					
English Codling	7	8	9	L	Y	7			Aug.-Sept									0					
Eicke	7	9	9	S	R	7			March-April									0					
Esopus Spitzenburg	8	8	7	L	R	10			Jan.-March				*	*	*	*		0		*			
Fallawater	10	9	6	L	R	5			Jan.-March				0	0	*	*		0	**				
Fall Jenneting	9	9	9	L	Y	5			Sept.-Oct									0					
Fall Pippin	10	10	8			6	6	6	Oct.-Dec				0	0	0	*	*	0	*				
Fameuse	9	9	10	L	R	10	10	10	Sept.-Dec				0	0	*	**	**	**	*	**			
Fanny	9	9	9	L	R	8			Oct.-Nov									†					
Gano	9	9	10	L	R	6			Feb.-May									**					
Garden Gem	9	9	10	L	R.S	10			Oct.-Nov									*					
Golden Sweet	9	9	10	L	Y	6	1		Aug.-Sept				*	0			0	0					
Grand Sultan	10	10	10	L	Y.S	7	6	6	Aug.-Sept							*		0					
Golden White	10	10	10	L	R	8	8		Sept.-Oct									*					
Gravenstein	10	10	9	L	R	10	10	10	Aug.-Sept				*	**	0	**	*	*	*				
Green Fameuse	9	9	9	M	Y	8												0					

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Varieties.	Tree.			Fruit.						Adaptation.												
										Southern Stations.					Middle Stations.				Northern Stations.			
	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Quality.	Value for home market.	Value for foreign market.	Season of use. With dates.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.	No. 15.
Gideon	8	8	10	....	....	10	10	8	Oct.-Dec	....	....	....	....	....	*	....	....	*	*	**	**	....
Grimes Golden	9	9	9	M	Y	10	....	....	Dec.-March	....	....	....	....	0	*	*	*	*	00	....	....	....
Greening	8	9	9	L	S.Y	8	10	10	Jan.-March	....	....	....	**	*	**	**	**	*	**	....	00	....
Gravel Pippin	8	9	8	L	R	7	....	....	Nov.-Dec	....	....	....	....	....	....	....	....	*	....	....	....	....
Graice	8	9	8	L	Y	8	....	....	October	....	....	....	....	....	....	....	....	0	....	....	....	....
Haas	9	10	9	L	R	5	....	....	Sept.-Oct	....	....	....	....	0	0	*	**	0	0	0	....	....
Hastings	8	9	9	L	R	8	....	....	Jan.-Feb	....	....	....	....	....	....	....	....	0	....	....	....	....
Hawthornden New	8	8	9	L	Y	6	....	....	Oct.-Dec	....	....	....	....	....	....	....	....	0	....	....	....	....
Hawthornden Old	8	8	9	L	Y	6	....	....	Sept.-Nov	....	....	....	*	....	....	0*	....	0	....	....	....	....
Hawthornden Seacliffe	8	10	10	L	Y	7	....	....	Sept.-Oct	....	....	....	....	....	....	....	....	*	....	....	....	....
Hardtimes Pippin	8	10	10	L	R	9	....	....	Oct.-Nov	....	....	....	....	....	....	....	....	†	....	....	....	....
Hawley	8	10	6	L	Y	8	....	....	Sept.-Oct	....	....	....	....	0	....	....	....	0	....	....	....	....
Highland Beauty	8	9	9	L	Y.R	8	....	....	"	....	....	....	....	....	....	....	....	0	....	....	....	....
Hamilton	8	9	10	L	Y	6	....	....	"	....	....	....	....	....	....	....	....	0	....	....	....	....
Horn	8	10	10	M	R	7	....	....	Dec.-Mar	....	....	....	....	....	....	....	....	*	....	....	....	....
Holland Pippin	8	10	8	L	Y	8	....	....	Oct.-Dec	....	....	....	*	....	....	0	*	0	....	....	....	....
Hubbardston's Nonesuch	8	10	9	L	R	8	8	....	Dec.-Mar	....	....	....	....	*	....	....	0	*	....	....	....	....
Hurlbut	8	10	10	M	R	8	8	....	Nov.-Feb	....	....	....	....	....	†	....	....	*	*	....	....	....
Hare Pipka	9	10	7	8	R	6	7	....	Sept	....	....	....	....	....	....	....	....	....	*	....	....	....
Isabella	10	10	5	L	Y	6	....	....	Oct.-Dec	....	....	....	....	....	....	....	....	0	....	....	....	....
Isham	8	10	9	L	R	6	....	....	"	....	....	....	....	....	....	....	....	0	....	....	....	....
Ingram	8	10	8	M	R	8	....	....	Jan.-Mar	....	....	....	....	....	....	....	....	0	....	....	....	....
Jonathan	8	10	10	M	R	10	10	....	Dec.-Mar	....	....	....	....	†	....	*	....	0	....	....	....	....
Jefferis	8	9	9	L	R	8	....	....	Sept.-Oct	....	....	....	....	....	....	....	....	*	....	....	....	....
Jersey Sweet	10	10	10	L	Y	6	....	....	Oct.-Dec	....	....	....	....	....	....	....	....	0	....	....	....	....
Kentish Fillbasket	10	10	8	L	R	6	9	....	Oct.-Nov	....	....	....	....	0	*	*	*	0	*	....	....	....
Keswick Codling	8	8	9	L	Y	6	....	....	Sept	....	....	....	....	0	0	....	....	0	....	....	....	....
Kean's Seedling	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*	....	....	....
King	10	10	4	L	R	10	10	10	Dec.-Mar	....	....	....	**	**	*	**	*	0	*	....	00	00
Lady	7	9	10	S	R	10	....	....	"	....	....	....	....	0	....	....	....	0	....	....	....	....
La Rue	10	8	5	L	R	6	8	....	Sept.-Oct	....	....	....	....	0	....	**	....	0	*	*	*	....
Lawver	8	10	9	L	R	7	8	....	Jan.-Apr	....	....	....	....	....	....	....	....	*	....	....	....	....
Lady Sweet	8	9	8	L	R	7	....	....	Jan.-Mar	....	....	....	....	....	....	....	....	*	....	....	....	....
Longfield	8	8	8	M	Y.R	7	....	....	Oct.-Dec	....	....	....	....	....	....	....	0	0	....	*	....	....

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Lord Burleigh	10	9	9	....	....	....	8	8	Jan.-May	....	....	....	....	....	....	....	....	0	0	....	..	....
Lord Suffield	6	8	9	.....	.....	.....	5	3	Aug.-Sept	..	....	....	..	....	....	....	....	0	....	....	....	....
Lovell	6	8	9	.....	.....	.....	5	5	Sept	....	....	....	....	....	0	....	....	....	*	....	....	....
Mann	10	10	6	L	G.Y	7	8	9	Feb.-May	....	....	....	0	*	*	*	*	0	*	*	0	....
Maiden Blush	9	10	10	L	Y.R	8	8	8	Oct.-Dec	....	....	....	....	*	....	....	....	0	*	....	....	....
Margil	6	7	9	M	R	9	.. ..	.....	Nov.-Jan	....	....	....	....	....	....	....	....	0	....	....	....	....
Magog Red Streak	8	9	9	L	Y.R	5	.....	.....	Nov.-Dec	....	....	....	....	....	....	....	....	0	....	....	..	....
Mammoth Black Twig	9	9	9	L	R	7	.....	.....	Dec.-March	....	....	....	....	..	....	....	....	*	....	....	....	....
McLellan	9	9	7	L	Y	10	.....	.....	Oct.-Nov.	....	....	....	....	..	....	....	....	*	....	....	....	....
McIntosh Red	9	10	9	L	R	10	10	10	Nov.-Jan	....	....	....	....	*	....	*	*	*	**	*	**	....
Minkler	9	10	8	L	R	6	.....	.....	Jan.-April	....	....	....	....	....	....	..	**	†	....	....	....	....
Mother	6	7	7	L	R	10	.....	.....	Nov.-Jan	....	....	....	....	....	*	....	....	†	....	....	..	....
Mountain Beet	8	9	8	L	R	7	.....	.....	Sept.-Oct	....	....	..	..	....	....	....	....	†	....	....	....	....
Mountain Tulip	7	7	8	L	R	6	.....	.....	Sept.-Oct	....	....	....	....	....	0	....	....	0	....	....	....	....
Missouri Pippin	8	9	9	L	R	8	.....	....	Jan.-March	....	....	....	....	....	....	....	....	**	....	....	....	....
Munson Sweet	10	10	10	L	Y	7	.....	.....	Sept.-Oct.	....	....	..	..	....	....	0	....	0	....	....	..	....
Malinda	8	9	8	M	Y	7	.....	.....	Feb.-March	....	....	....	....	....	....	....	....	†	....	....	....	....
Milwaukee	10	10	9	.....	.....	7	8	.....	Dec.-March 1st.	....	....	..	..	....	....	....	....	....	....	*	....	....
Newton Pippin (Green)	8	10	8	L	G	9	.....	10	Feb.-March	....	....	....	....	0	....	....	....	0	....	....	..	....
Northern Spy	10	8	10	L	R	9	9	9	Jan.-March	....	....	..	**	**	**	**	....	**	**	0	00	....
Northfield Beauty	9	9	9	M	R	9	.....	.....	September	....	....	....	....	....	....	....	....	0	....	....	....	....
Norcaster Spy	8	9	9	....	R	9	.....	.....	September	....	....	....	....	....	....	....	....	0	....	....	....	....
Ontario	9	10	10	L	Y.R	9	.....	.....	Jan.-March.	....	....	....	*	**	**	**	*	**	**	*	....	....
Oldenburg	9	10	10	L	R	9	10	7	Aug.-Sept	....	....	....	*	**	**	**	*	**	**	*	**	....
Old Pearmain	8	10	10	S	G	6	....	....	Jan.-March	....	....	....	....	....	....	....	....	0	....	....	....	....
Pewaukee	10	10	8	L	R	9	.....	.	Jan.-March	....	....	....	*	0	*	0	*	0	**	*	....	....
Parlin's Beauty	8	9	9	L	R	9	....	....	Nov.-Dec	....	....	....	..	....	....	....	....	*	....	....	....	....
Palouse	8	9	8	L	R	8	.....	....	Oct.-Nov	....	....	....	..	....	....	....	....	†	....	....	..	....
Peter	8	10	8	L	R	8	.....	.....	Sept.-Oct.	....	....	....	....	....	†	....	....	†	....	*	....	....
Princess Louise	6	7	8	....	.....	.....	8	.....	Dec.-Feb	....	....	....	....	*	....	....	*	....	*	....	....	....
Peck's Pleasant	8	9	8	L	Y	8	.....	.....	Nov.-Jan	..	....	....	....	*	....	....	....	†	....	....	....	....
Plumb's Cider	8	9	8	L	R	5	.....	.....	Oct.-Dec	....	....	....	0	....	....	....	....	0	....	....	....	....
Prinyea	8	8	9	L	Y	9	.....	.....	Sept..Oct	....	....	....	....	....	....	....	....	0	....	....	....	....
Pioneer	8	9	8	L	Y	7	.....	.....	Nov.-Dec	....	....	....	....	....	....	....	....	0	....	....	....	....
Primate	8	9	10	L	Y	10	...	.....	July-Sept	....	....	....	....	....	....	....	....	*	....	....	....	....
Pomme Gris	8	10	10	S	Rus	10	.....	.....	Oct.-Dec	....	....	....	....	..	..	..	....	0	....	....	....	....
Pound Sweet	10	10	9	L	Y	7	...	...	Dec.-Feb.	....	....	....	....	....	....	....	....	0	....	....	....	....
Pointed Pipka	8	10	10	L	R	8	.....	....	Aug.-Sept	....	....	....	....	....	....	....	....	*	....	....	....	....
Rawle's Janet	6	9	10	S	R	6	....	....	Jan.-May	....	.	....	....	....	....	....	....	0	**	*	....	....
Rambo	8	9	9	L	R	7	.....	...	Oct.-Jan	....	....	....	*	0	0	0	....	0	....	....	....	....
Red Russet	8	9	9	M	R	8	.....	.....	Jan.-May	....	....	....	....	....	....	....	....	†	....	....	....	....
Reinette Verte	9	9	9	L	R	8	...	.....	Jan. Mar	....	....	....	....	....	....	....	....	†	....	....	....	....
Rome Beauty	9	8	9	L	R	7	.....	.....	"	....	....	....	....	....	....	....	....	*	....	....	....	....
Reinette Gris	8	9	9	L	R	9	.....	.....	Nov.-Jan	....	....	....	....	....	....	....	....	†	....	....	....	....
Ribston	8	9	6	L	R	10	.....	.....	Dec.-Feb.	....	....	....	*	*	0	*	*	*	....	....	....	....
Rivers Winter Peach	8	9	8	S	R	8	.....	.....	"	....	....	....	....	....	....	....	....	0	....	....	....	....
Rochelle	9	10	8	L	R	7	.....	.....	Oct.-Dec	....	....	....	....	....	....	....	....	0	....	....	....	....
Roxbury Russet	8	9	9	L	Rus	7	9	9	Feb.-May	....	....	....	**	**	*	*	....	*	*	....	....	....
Saxton	8	9	9	L	R	7	....	....	Oct.-Nov	....	....	..	....	....	.	....	....	†	....	....	....	....
Scotts Winter	9	10	10	S	R	6	...	.....	Jan.-Feb	....	....	....	....	....	....	....	....	†	....	**	*	....

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Varieties.	Tree. Vigor.	Hardiness.	Productiveness.	Fruit. Size.	Color.	Quality.	Value for home market.	Value for foreign market.	Season of use.	Adaptation. Southern Stations. No. 1.	No. 2.	No. 3.	No. 4.	No. 18.	Middle Stations. No. 5.	No. 6.	No. 8.	No. 9.	Northern Stations. No. 7.	No. 10.	No. 14.	No. 15.
Scarlet Pippin	9	10	10	L	Y	10	10		Sept.-Dec									+		**		
Shannon	10	10	10	L	Y	7			Nov.-Dec									0				
Swaar	8	8	7				8		Dec.-Mar					0			*	0				
Sops of Wine	8	8	7	L	R	5			Aug.-Sept						0	0		0				
Seek-No-Further	8	9	10	M	R	7			Dec.-Mar				*	0	0		0	*		*		
Smart's Golden	8	10	10	M	Y	8			Jan.-Mar									+				
St. Lawrence	9	10	10	L	R	8			Sept.-Oct				*	0	0			+				
Stump	8	9	9	L	R	7			"								0					
Stark	10	10	10	L	R	6			Feb.-May					*				0				
Sutton Beauty	8	9	9	L	R	7			Dec.-Feb						*		**	**	**			
Switzer	10	10	9	L	R	7			Sept									0				
Stotts Russet	9	10	8	L	Rus	7			Dec.-Jan									0				
Swazie	9	10	7	L	Rus	6			Feb.-May						*		*	+	*			
Star	9	10	10	L	Y	10		9	Sept				0	**	*	*		+				
Salome	10	10	9	L	R	9			Jan.-Mar											*		
Sweet Bough	8	7	8		Y	9	9		Sept.-Oct				*	*	++		**		*			
Sour Bough	8	10	6		Y	10	7		Sept						0							
Tolman Sweet	9	10	9	L	Y	1	2		Dec.-Apr				*	*	*		*	*		*		
Trenton	10	10	10	L	Y	7			Sept.-Oct									**				
Tetofsky	4	8	6	S	R	9			Aug						*	+	+					
Utters Red	9	8	8	L	Y	5	6		Nov						*	0	**					
Vermont Sweet	9	10	8	L	R	6			Nov.-Dec									0				
Wagener	8	10	10	L	Y	9			Nov.-Jan				*	*	0	*		0		*		
Wellington	8	9	9	L	R	8			Jan.-Mar									0				
Wealthy	9	10	10	L	R	8			Oct.-Nov				*	*	*	*	**	*		**		
Western Beauty	9	9	9	L	R	8			Sept.-Oct									0				
Walbridge	9	10	9	L	R	8			Dec.-Feb							0		+	0			
Whinery	9	10	9	M	R	8			Jan.-Mar									0				
Walter	9	10	9	L	R	8			Nov.-Dec									+				
Wineap	8	9	9	M	R	8			Feb.-May							+		0				
Winter St. Lawrence	9	10	8	L	R	9			Jan.-Mar									+				
Wolf River	10	10	9	L	R	7			Nov.-Jan								+			**	+	
Windsor Chief	9	9	9	L	R	7												0				
White Pippin	8	9	8	L	G.W	7			Feb.-Mar									0				

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Varieties.	Tree.			Fruit.						Adaptation.											
										Southern Stations.					Middle Stations.				Northern Stations.			
	Vigor.	Hardiness.	Productiveness.	Size.	Color of skin.	Flavor.	Quality.	Value for market.	Season of use. With dates.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.	No. 15.
Brusseler Braune	9	10	6	L	D.R	A	8	8	Sept. 1					*					*			
Bessarabian	9	10	7	L	D.R	A	8	8	" 1										*			
Choisy	6	9	4					5	June					*								
Cleveland	9	8	8					6	"					**								
Coe	10	8	6					6	June-July					0					**			
Dyehouse	9	10	10	M	D.R	A	8	9	July 16					*					**			
Eagle	7	8	4					8	" 1-10					0								
Early Purple	9	9	5					8	June 15-25					*								
Elkhorn	8	8	10					10	July 10-20					**			*					
Elton														*								
English Morello	10	10	10	L	D.R	A	9	10	" 16					**		*	**			**	**	
Eugenie	9	10	7						June					*			**					
Early Richmond	8	10	7											**							**	
Griotte Du Nord	9	10	6	L	D.R	A	9	10						*					*			
Grenner Glas	10	9	8	L	B.R	A	9	9	July 10					*					**			
Geo. Glass	10	9	8	L	B.R	S	10	10	" 12										**			
Hortense														**	*							
Kentish (Late)													*	*	*			*	*			
Knight	7	8	6					9	June 20-30		**			**								
Koslov Morello									July					*								
Late Duke														**	*							
Lutovka	10	10	8	L	B.R	S	10	10	July 12					*					*			
Litham	10	10	9	S	B.R	A	9	9	" 15										*			
Magnifique														*			*					
May Duke	8	9	7						June 15 30					**								
Mazzard	10	10	4						July 1-12					0								
Mezel	10	8	10						" 4-15					**								
Montmorency	6	10	8						" 1-10	**	**	**	*	**	*	**	**		*			
M. Ordinaire														*	**	**						
Napoleon	9	8	10						July 4-12		*			**								
Olivet	8	10	7											**	*							
Orel	8	10	9	L	R	A	9	9	July 15					*					*			
Orel 24	8	9	9	M	B	S	10	10	" 15										**			

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Ostheim	5	10	8	.....	D.R	S	7	6	July 18.	....	....	....	....	*	....	....	....	....	.....	.....	....	.....
Philippi	....	....	....	.....	.....	.....	.....	.....	.....	....	....	....	....	....	**	....	....	....	.....	.....	*	....
Rockport	....	....	....	.....	.....	.....	.....	.....	.....	....	*	....	....	*	*	.....	*	....	.....	.....	.....	.....
Russian 207	10	10	9	L	R	A	9	10	July 10	....	....	....	....	....	....	.....	....	....	**	.....	....	.....
Spanish	10	8	6	Y	S	.....	10	7	" 4-12	....	....	....	....	**	*	.....	....	....	.....	.....	*	.....
Tartarian	8	8	7	.....	.....	.....	.....	.....	.....	....	**	....	....	**	....	*	**	....	0	.....	.....	.....
Vladimir	....	....	....	.....	.....	.....	.....	.....	.....	....	....	....	....	0	....	.....	....	....	0	.....	.....	.....
Windsor	8	10	8	.....	.....	.....	.....	.....	.....	....	....	....	....	**	*	.....	....	**	.....	.....	.....	.....
Wood	7	8	8	.....	.....	.....	.....	.....	June 20-July 4	....	....	....	....	**	....	*	....	....	0	.....	.....	.....
Wragg	8	10	7	.....	D.R	A	4	6	July 22	....	....	....	....	*	**	.....	....	....	.....	.....	.....	.....

Key to Quality:

1 Very poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
8—9 Very good.
10 First class.

Key to Market Value:

1— 3 4th rate.
4— 6 3rd rate.
7— 8 2nd rate.
9—10 1st rate.

Key to Season:

E—Early.
M—Medium.
L—Late.
Dates of use.

Key to Adaptation:

* Desirable.
** Especially desirable.
† Promising
0 Undesirable.
00 Not hardy.

Key to Stations:

1 Southwestern.
3 Wentworth.
4 Burlington.
5 Lake Huron.
6 Georgian Bay.
7 Simcoe.
8 East Central.
9 Bay of Quinte.
10 St. Lawrence.
13 Secretary's fruit farm.
14 Algoma.
15 Wabigoon.

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CATALOGUE OF FRUITS—GRAPES.

Key to Quality:
1 Very Poor.
2— 3 Poor.
4— 5 Fair.
6— 7 Good.
8— 9 Very Good.
10 First Class.

Key to Market Value:
1— 2 4th Rate.
4— 6 3rd Rate.
7— 8 2nd Rate.
9—10 1st Rate.

Key to Adaptation:
*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Key to Stations:
1 Southwestern.
3 Wentworth.
4 Burlington.
5 Lake Huron.
6 Georgian Bay.
7 Simcoe.
8 East Central.
9 Bay of Quinte.
10 St. Lawrence.
13 Secretary's fruit farm.
14 Algoma.
15 Wabigoon.

Tested at Wentworth Experimental Station by M. Pettit, Winona.	Season in use.	Vine.					Fruit.			Adaptation.											
										Southern Stations.					Middle Stations.				Northern Stations.		
		Vigor, scale 1-10.	Hardiness, scale 1-10.	Productiveness, scale 1-10.	Freedom from disease, scale 1-10.	Total value of Vine, max. 40.	Quality, scale 1-10. Dessert.	Value, scale 1-10. Home market.	Total value of fruit.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
Adirondac	September	8	2	2	2	9	9	2	11	....	**	....	*	**	....	....	**	....	....	....	....
Agawam (Rog. 15)	Oct.-Nov.	9	9	8	4	30	9	9	18	....	..	....	.	....	....	....	.	....	..	....	....
Alvey (Hagar)	October	7	8	6	8	29	2	2	4	....	....	....	....	....	....	....	....	....	....	....	....
Amber	"	6	6	3	4	19	2	2	4	....	....	....	....	....	....	....	....	....	....	....	....
Amber Queen	Oct.-Nov.	7	6	5	6	24	6	5	11	....	....	....	....	....	....	....	0	....	....	....	....
Aminia	September	6	8	7	7	28	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....
America	October	8	9	6	7	30	2	....	....	....	....	....	....	....	....	....	*	....	....	....	....
August Giant	September	8	8	7	8	31	5	5	10	....	....	....	....	0	....	....	....	....	....	....	....
Bacchus	October	9	9	8	8	34	2	....	....	....	....	....	....	0	....	....	....	....	....	....	....
Barry	"	9	9	8	7	33	7	7	14	....	....	....	*	....	....	....	....	....	....	....	....
Berckman's	September	6	6	5	7	24	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Black Delaware	"	4	7	4	7	22	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Black Eagle	"	7	5	6	6	24	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Black Pearl	"	9	9	9	9	36	2	2	4	....	....	....	....	....	....	....	....	....	....	....	....
Brighton	"	8	10	7	6	31	8	7	15	....	*	....	0	**	*	**	*	....	....	....	....
Brilliant	"	8	8	7	7	30	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Cambridge	October	8	8	8	6	30	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Catawba	Oct.-Nov.	8	10	8	5	31	10	....	....	....	*	....	0	*	....	....	....	....	....	....	....
Colerain	September	7	7	8	8	30	8	10	20												
Concord	Sept.-Oct.	10	10	10	9	39	6	10	16	....	*	....	**	**	**	*	*	....	....	*	*
Cottage	September	6	8	3	8	25	4	4	8	....	....	....	....	....	....	....	....	....	....	....	....
Clinton	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	*	....	0	0	**	0	*	....	....	....	....
Creveling	September	10	10	6	6	32	6	4	10	....	....	....	....	*	....	....	....	....	....	....	....
Croton	"	6	7	6	6	25	8	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....
Cynthiana	October	7	8	5	6	26	2	.....	.....	....	....	....	....	....	....	....	....	....	....	....	....
Champion	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	....	....	....	....	....	....	....	....	....	....	*

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CATALOGUE OF ONTARIO FRUITS.—BLACKBERRIES.

Varieties.	Tree.			Fruit.				Southern stations.	
	Vigor.	Hardiness.	Productiveness.	Size.	Quality.	Value for home market.	Season of use. With dates.	No. 4.	No. 18.
Agawam	4	10	8	M	7	8	July 23-Aug. 15	*	*
Ancient Briton	7	9	6	M	7	7	" 21 " 10	0	.....
Child's Tree	7	9	7	S.M	8	6	" 20 " 10	0	.....
Dorchester	9	9	7	L	9	8	" 23 " 12	0	.....
Early Cluster	9	7	6	M	6	7	" 25 " 10	00	.....
Early Harvest	7	7	9	S.M	5	8	" 12 " 1	*	
Early King	7	9	8	S.M	7	8	" 12 " 5	*	.....
Eldorado	8	9	7	M.L	8	8	" 23 " 10	0	.....
Erie	9	10	8	M	8	8	" 23 " 10	*	
Gainor	9	9	8	L	9	9	" 23 " 10	*	.....
Kittatinny	10	9	9	L	10	10	" 25 " 20	*	**
Lovett's Best	8	10	7	S	6	5	" 25 " 15	0	.....
Maxwell	5	7	5	L	8	9	" 20 " 10	00	.....
Minnewaski	8	7	6	M	8	8	" 20 " 10	00	.....
Ohmer	8	9	8	L	8	9	" 23 " 10	†	.....
Snyder	7	10	10	M	8	9	" 18 " 5	*	*
Stone's Hardy	8	10	8	M	9	9	" 23 " 10	†	*
Taylor	9	9	8	M	9	9	" 23 " 10	*	*
Wasaachusetts	9	10	6	M	10	7	" 23 " 15	0	.....
Western Triumph	9	10	9	M	8	9	" 23 " 10	*	.....
Wilson's Early	6	9	6	L	8	9	" 20 " 12	0	*
Wilson's Junior	10	9	6	L	8	9	" 20 " 10	0	*

CATALOGUE OF ONTARIO FRUITS—CURRANTS.

Varieties.	Bush.				Fruit.					Southern Stations.	
	Origin.	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Quality.	Value for Home Market.	Season of Use. With Dates.	No. 4.	No. 18.
Belle de St. Giles	.....	7		5	L	R	10	8	July 8—Aug. 1	0	.....
Black Victoria	.....	8		8	L	B	9	9	" 10— " 5	†	.....
Brayley's Seedling	.....	8		9	M	R	6	8	" 10— " 1	†	.....
Champion	Eng.	9		7	L	B	7	8	" 25— " 15	0	.....
Cluny	Europe	8		9	L	R	7	10	" 6—July 31	**	.....
Collin's Prolific	.....	10		9	L	B	8	10	" 20—Aug. 10	†	.....
Crandall	.....	10		7	M-L	B	7		" 15— " 30	.....	.....
Fay's Prolific	N. Y.	7		7	L	R	8	9	" 8— " 1	*	**
Lee's Prolific	.....	8		7	L	B	8	9	" 15— " 10	*	*
Naples	Europe	8		8	L	B	8	10	" 12— " 10	**	.....
New Victoria	.....	8		6	S-M	R	8	8	" 9— " 1	0	.....
North Star	Minn.	8		7	M-L	R	7	9	" 12— " 15	0	.....
Pomona	.....	8		8	L	R	9	10	" 11— " 5	†	.....
Prince Albert	.....	8	All hardy thus far.	.....	S-M	R	6	.....	" 17— " 10	.....	*
Raby Castle	.....	8		10	S-M	R	7	8	" 12— " 5	*	*
Red Cross	.....	7		7	S-M	R	8	6	" 12— " 1	0	.....
Red Dutch	Europe	8		7	S	R	9	6	" 5— " 1	0	.....
Red Victoria	Eng.	8		9	L	R	8	10	" 9— " 1	*	.....
Saunders	Ont.	8		8	L	B	9	10	" 15— " 10	†	.....
Versailles	France	8		7	M	R	8	8	" 7— " 1	0	.....
White Grape	Europe	8		8	L	W	7	7	" 14— " 7	*	0
White Imperial	.....	8		7	L	W	10	8	" 8— " 1	†	.....
Wilder	N. Y.	8		10	L	R	9	10	" 8— " 1	**	.....

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CATALOGUE OF ONTARIO FRUITS.—PEACHES.

Key to Quality:
1— Very Poor.
2—3 Poor.
4—5 Fair.
6—7 Good.
8—9 Very Good.
10— First Class.

Key to Market Value:
1—3 4th rate.
4—6 3rd rate.
7—8 2nd rate.
9—10 1st rate.

Key to Season:
E—Early.
M—Medium.
L—Late.
Dates of use.

Key to Adaptation:
*—Desirable.
**—Especially Desirable.
†—Promising.
0—Undesirable.
00—Not Hardy.

Key to Stations:
1 Southwestern.
3 Wentworth.
4 Burlington.
5 Lake Huron.
6 Georgian Bay.
7 Simcoe.
8 East Central.
9 Bay of Quinte.
10 St. Lawrence.
13 Secretary's fruit farm.
14 Algoma.
15 Wabigoon.

Varieties.	Tree.				Fruit.						Adaptation.											
											Southern Stations.					Middle Stations.				Northern Stations			
	Origin.	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Adhesion to pit.	Value for home market.	Value for foreign market.	Seasons of use. With dates.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.	No. 15.
Alexander	Ill	9	9	10	6	W	C	3	2	July 22-31	0			*	*							
Amsden	?	9	9	10	6	W	C	3	2	"	0											
American Apricot	?	8	9	8	6	Y	F	5	5	Aug. 1	†											
Barnard Early	Ill	8	9	10	5-6	Y	F	8	5-8	Sept. 1	*				*							
Beer's Smock	N. J.	9	9	8	8-9	Y	F	9	9	Oct. 1	*											
Brunson	Mich.	9	10	10	7	Y	F	9	8	Sept. 15	*											
Brigden	?	8	8	8	8-10	Y	F	10	10	Aug. 10	**				**							
Boyl's Yellow	Mich.	8	9	10	6	Y	F	7	7	" 25	†											
Banner	Ont.	10	10	9	8	Y	F	10	9	Oct. 1	*											
Bokara	Asia	8	10	9	2	W	C	0	0	Sept. 25	0											
Carlisle	?	9	9	10	7	W	F	5	5	" 1	†											
Crosby	Mass.	9	10	10	6-8	Y	F	9	8	" 15	*			†	*							
Connecticut	Conn.	8	9	10	7	Y	F	5	4	" 5	0											
Champion	Ill	8	8	7	9-10	W	C	8	6	" 3	†			*	**							
Canada (Ea)	Ont.	9	9	10	6	W	C	3	2	July 22	0											
Crane's Yellow	Mich.	9	9	9	8-9	Y	F	10	10	Aug. 15	**											
Dumont	?	8	8	9	4 6	Y	F	6	5	Sept. 8	†											
Elberta	Ga.	7	7	8	10	Y	F	10	10	" 12	**			**	**							
Early Rivers	Eng.	8	9	10	7-8	W	S.C	5	4	Aug. 5	†				*							
Early Crawford	N. J.	9	8	8	8-10	Y	F	10	10	" 24	*			*	**							
Early Michigan	Mich.	8	10	10	7	W	F	3	2	" 25	0											
Engle Mammoth	Mich.	9	9	10	6-8	Y	F	10	10	Sept. 8	**											
Fitzgerald	Ont.	8	9	10	8-9	Y	F	10	10	" 28	**				*							
Foster	?	8	8	2	9-10	Y	F	9	9	Aug. 30	0				*							
Family Favorite	?	8	8	8	7-9	W	F	7	6	Sept. 15	†											
Globe	Penn.	10	10	1	10	Y	F	5	7	Oct. 1	0											
Garfield	U. S.	8	8	8	8-9	Y	F	10	10	Aug. 20	**				**							
Golden Drop	Mich.	8	10	10	6-7	Y	F	8	8	Sept. 20	**											
Great Western	U. S.	8	10	8	7	W	C	2	1	Oct. 5	0											
Greensboro	?	9	9	10	7-8	W	C	5	5	Aug. 6	†				*							

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Varieties.	Origin.	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Adhesion to pit.	Value for home market.	Value for foreign market.	Seasons of use. With dates.	Southern Stations. No. 1.	No. 2.	No. 3.	No. 4.	No. 18.	Middle Stations. No. 5.	No. 6.	No. 8.	No. 9.	Northern Stations. No. 7.	No. 10.	No. 14.	No. 15.
Hinman	?	9	9	9	8-9	Y	F	9	9	Sept. 4	+												
Hales Early	Ohio	9	10	10	4 6	W	S	5	3	Aug. 18	0				0								
Hills Chili	N. Y.	7	10	10	5-8	Y	F	8	7-9	Sept. 12	+												
Horton Rivers	?	8	9	9	7-9	W	C	6	6	Aug. 8	0												
Jacques Rareripe	Mass.	9	9	10	7-8	Y	F	8	8	Sept. 12	*				*								
Kalamazoo	Mich.	9	10	10	7	Y	F	8	7	" 30	*				*								
Lee's Choice	Ont.	8	9	7	6-8	W	F	5	5	" 25	0												
Lemon Free	Ohio	9	10	10	6-10	Y	F	8	6	" 28	*				*								
Late Crawford	N. J.	9	9	6	10	Y	F	10	10	" 24	*				*								
Longhurst	Ont.	8	10	10	5-8	Y	F	8	8	" 12	*												
Lewis	Mich.	8	9	9	6	W	F	3	2	Aug. 25	0												
La Grange	?	8	9	7	7-9	W	F	6	5	Oct. 5	+												
Lorentz	?	8	8	5	7	Y	F	7	6	" 18	0												
Marshall's Late	... J.	9	8	6	7-8	Y	F	8	8	" 6	+												
Mt. Rose	N. J.	8	8	8	7-8	W	F	8	7	Aug. 24	*				*								
Moore's Favorite	Mass.	8	8	7	7-8	W	F	6	5	Sept. 12	0												
New Prolific	Mich.	8	10	10	7-9	Y	F	10	10	" 6	**												
Namaper	U. S.	8	8	10	10	Y	F	10	10	" 16	**												
Oldmixon Free	U. S.	8	6	4	8-10	W	F	10	8	" 1	*				*								
Oscar's Black Prince		9	9	10	7	W	C	4	3	July 25	+												
Orleans		8	8	8	7	Y	F	7	7	Sept. 10	+												
Orange Free		8	9	8	5	Y	F	6	5	" 12	0												
Picquett's Late		8	8	6	8	Y	F	8	8	Oct 5	+												
Pearce	Ohio	9	9	6	10	Y	F	8	9	Sept. 20	*												
Roser	?	9	8	8	3	W	F	1	1	Oct. 5	0												
Red River	?	9	9	10	7-8	W	S.C	5	4	Aug. 5	*												
Smock Free	N. J.	9	8	6	8-10	Y	F	8	9	Oct. 1	**				**								
St. John	A. M.	9	8	9	7-8	Y	F	10	9	Aug. 14					**								
Stephen's Rareripe	?	9	8	8	7-8	W	F	6	5	Sept. 20	+												
Snow's Orange	Mich.	7	8	8	5-6	Y	F	5	5	" 3	0												
Stump	N. Y.	8	8	7	6-7	W	F	6	5	" 28	+												
Salway	Eng.	9	9	10	7-8	Y	F	8	7-9	Oct. 10	*												
Summer Snow	?	9	9	10	7	W	C	2	1	" 5	0												
Triumph	Mich.	8	9	10	5 8	Y	S.C	7	8	Aug. 9					*								
Wager	N. Y.	8	9	10	5-7	Y	F	5	3-6	Sept. 8	0				0								
Wonderful	?	9	9	1	10	Y	F	6	3	Oct. 4	0												
Wheatland	N. Y.	8	8	1	8-9	Y	F	4	3	Sept. 1	0												
Yellow Rareripe	U. S.	8	8	6	8-9	Y	F	9	9	" 6	*												

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CATALOGUE OF ONTARIO FRUITS.—RASPBERRIES.

Varieties.	Season of use. With dates.	Southern Stations.		Middle Stations.
		No. 4	No. 13.	No. 5.
All Summer	July 8—Oct. 15	0		0
Columbia	" 13—July 28	+		
Cuthbert	" 13— " 31	**	**	
Golden Queen	" 5— " 20	*	*	
Gregg	" 13— " 31	*	*	
Hilborn	" 5— " 20	*	*	
Japan Wine	" 25—Aug. 10	0		
Kansas	" 5—July 20	**		
Kenyon	" 12— " 25	0		
Lottie	" 10— " 25	0		
London	" 13— " 31	*		
Lovett	" 10— " 25	0		
Marlboro	" 5— " 25	**	**	
Miller	" 6— " 25	*		
Mills	" 9— " 20	0		
Ohio	" 28— " 25	*		
Older	" 8— " 25	*		
Palmer	" 1— " 20	*		
Phoenix	" 11— " 25	0		
Progress	" 3— " 20	0		
Redfield	" 10— " 20	+		
Reliance	" 3— " 31	+		
Royal Church	" 13— " 31	0		
Shaffer's Colossal	" 10— " 30	*		
Smith's Giant	" 13— " 31	*		
Souhegan	" 8— " 25	*		
Thompson	" 8— " 31	0		
Wiuant	" 10— " 30	0		

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Varieties.	Tree. Vigor.	Tree. Hardiness.	Tree. Productiveness.	Fruit. Quality.	Fruit. Value for home Market.	Fruit. Season of use. With dates.	Adaptation. Southern Stations. No. 2.	Southern Stations. No. 4.	Southern Stations. No. 13.	Middle Stations. No. 5.	Middle Stations. No. 6.	Middle Stations. No. 8.	Middle Stations. No. 9.	Northern Stations. No. 7.	Northern Stations. No. 10.	Northern Stations. No. 14.
Ananas d Ete	7	6	7	8	8	Sept.-Oct.							0			
Bartlett	8	8	9	9	10	Sept.	**	**	**	**	**	**	**	†	00	00
Bergamot Gansels	6	9	5	8	5	Sept.-Oct.										
Bergamot Gansels, late	6	8	8	2	4	Jan.-March.										
Belle Lucrative	7	6	7	8	6	Sept.-Oct.		*		*	*	**	0			
Beurre Antoine	7	7	7		6	Oct.- Dec.						**				
Beurre Assomption	7	5	6	6	8	Sept.										
Beurre Bosc	8	7	8	9	10	Oct.-Nov.	**	**	**	**		†	*	†		
Beurre Bachelier	7	8	8	5	9	Oct.-Nov.										
Beurre Baltet Pere	6	6	8	5	6	Nov.-Dec.										
Beurre Clairgeau	6	5	8	5	8	Nov.-Dec.						*				
Beurre d' Amanlis	8	9	9	5	4	Sept.										
Beurre d' Anjou	9	10	4	9	10	Nov.-Dec.	**	**	**	**		†	*	†		
Beurre Diel	7	8	6	8	7	Nov.-Dec.			*			*				
Beurre Hardy	8	8	6	7	7	Oct.			**	*	*	*	*			
Beurre Superfine	8	10	6	8	6	Oct.						*				
Beurre Giffard	7	7	7		9	Aug.										
Brandywine	8	8	5	7	5	Sept.						0				
Buffum	8	7	8	6	5	Sept.-Oct.			*				*	*	†	
Clapp's Favorite	9	7	9	9	9	Sept.	*	**								
Doyenne d' Ete	7	7	8	7	4	July-Aug.							**			
Doyenne Boussock	9	8	7	7	9	Sept.-Oct.										
Duchess de Bordeaux	7	7	6	7	5	Jan.-Mar.										
Duchess Precoce	17	8	10	6	10	Sept.						**	†			
Dorset													†			
Flemish Beauty	10	8	9	8	8	Oct.			*	*	*	0	*			
Goodale	8	9	9	7	8	Oct.				*	*	*	0			
Glout Morceau	5	4	6	5	4	Dec							0			
Graslin	8	6	8	6	7	Oct.-Nov.										
Howell	7	7	9	6	8	Oct.					*	*	0			
Idaho	8	7	8	7	5	Oct.					*	*	0			
Josephine de Malines	7	7	8	9	7	Dec.-Feb.			*	*		*	*	†		
Keiffer	7	7	10	5	6	Nov.-Dec.			*		*	**	0			
Lawrence	7	7	8	9	7	Nov.-Jan.			*			**	0			

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Louise Bonne	7	7	9	7	7	Sept.-Oct.						*		†				
Lawson												*		†				
Le Conte	9		10	5	5	Oct.			0				0					
Manning's Elizabeth			10	7	4	Nov.-Dec.							0	0				
Mount Vernon	8	8	7	4	7	Nov.-Dec.			*			*	0					
Margaret									*									
Osband's Summer	6	7	6	7	5	Aug.			*									
P. Barry						Dec.			*									
Petite Marguerite				8	5	Aug.			*									
President Druard	7	9	7		5	Dec.-Jan.						*						
Ritson	9	10	8		6	Oct.-Nov.										†		
Rostiezer	8	7	6	9	4	Aug.-Sept.			*			**	0					
Sheldon	9	8	7	9	9	Oct.	*	*				*.	0	†				
Souvenir de Congres	7	6	7	5	8	Aug.-Sept.	0					*	0					
Tyson	10	9	7	8	5	Sept.	*		*		*	*	0					
Seckel	7	9	8	10	7	Sept.-Oct.	*	*	*		*	*	0					
Vicar of Wakefield	8	6	8	3	6	Nov.-Feb.			0		*	*	0					
Winter Nelis	6	7	8	9	9	Jan.-Dec.			*			**		†				

CATALOGUE OF ONTARIO FRUITS.—PLUMS.

Varieties.	Tree.			Fruit.						Adaptation.											
										Southern Stations.					Middle Stations.				Northern Stations.		
	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Adhesion to pit.	Quality.	Value of home market.	Value of foreign market.	Season of use, with dates.	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8.	No. 9.	No. 7.	No. 10.	No. 14.
Abundance												**		*	*	†	*	**		†	†	†
Arch Duke	8	10								September		**					**					
Bradshaw	9	8	8					10		August		**		*	**	*	**	*		†		†
Burbank	10									September				*	**	†	*			**		
Bleeker's Gage																	*					
Bingham																						
Chabot																						
Coe's Golden Drop	4	8	8					10		Sept-Oct		**		*	*	*	**	*		†		
Columbus	10	8	10					10				*			**		*					
Damson	9	10	10					4				**		*		*	*					
Duane's Purple	9	8	5					7		August		*		*	*		*					
De Soto																				†	*	
Fellenberg												*		*			*	*				
General Hand	10	9	6					10		September		0		0	*	*	0	*		*		
Grace	10	10	9					7				*		*			**	*		*		
Golden	8	7	8					7		August		*										
German Prune	7	7	7					8		Sept.-Oct.		**		*		*	**	**		†		

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Varieties.	Tree.			Fruit.							Adaptation											
											Southern Stations.					Middle Stations.				Northern Stations.		
	Vigor.	Hardiness.	Productiveness.	Size.	Color.	Adhesion to pit.	Quality.	Value of home market.	Value of foreign market.	Season of use, with dates	No. 1.	No. 2.	No. 3.	No. 4.	No. 13.	No. 5.	No. 6.	No. 8	No. 9.	No. 7.	No. 10.	No. 14
Grand Duke												†				†	**					
Guii	10	10	8					7		August		*		0			*	*		*		
Howard's Favorite	8	10	8					6		Sept.-Oct							*					
Huling's Superb												**					*	**		*		
Imperial Gage	10	8	9					10		August		**		**	**	**	*	**				
Jefferson	7	6	6					10		Early Sept		*		*	*		*					
Lawrence's Favorite	10	8	8					7		August												
Lincoln																						
Lombard	10	10	10					8		September		*		**	*	**	*	**		**	*	
McLaughlin	8	7	6					9		August		*			*		*	**				
Moore's Arctic	7	10	10					7		Early August		*			0	**	*	*				**
New Goderich	9	9	10					8		September							*					
Niagara												**										
Ouillan's Golden Gage												*										
Orange	9	8	8					8		August		**		*	*		*	*		*		
Prince of Wales	6	7	6					10		September		**	*	*	*		*	*		†		
Peach	7	6	4					8		August												
Pond's Seedling	10	10	8					7		Last of Sept.			*	0	*	*	*	**		*	†	
Peter's Yellow Gage																	*	*		†		
Prince's Yellow Gage	9	10	8					6		Early August		**		*			*			**		
Purple Egg												**	*	**								
Quackenbos	10	10	9					7		September		*		**	*		**	*		*		
Reine Claude	10	10	8							Sept.-Oct	**	**	**	**	*		**	*				
Reine Claude Violette																						
Red Magnum Bonum												*	*					*				
Saunders	7	9	10						8		*	*	*									
Smith's Orleans	10	10	9							Aug.-Sept.		*		*		**	*	*				
Spaulding																		0				
St. Catharine	8	8	8							September		*										
Victoria												*					*	*				
Washington	9	7	8							Aug.-Sept.	*	**	*	*	*	*	**	**		0		
Willard	10	10	10								*											
Wild Goose																						
Wickson	10	10									*			*	†	†				†		
Yellow Egg	8	8	6							September	*	*	**	*	*	*	**	**		*	*	
Yellow Gage	6	7	8							August				**		*	0					

REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

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TORONTO.

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REPORT

OF THE

INSPECTOR OF FUMIGATION APPLIANCES.

1902.

To the Honorable John Dryden, Minister of Agriculture.

SIR,—I beg to submit herewith the Fourth Annual Report of the Inspector of Fumigation Appliances.

This report has been prepared by your present Inspector, partly from his personal observations during the fall of 1902, and partly from correspondence with your former Inspectors, Prof. Lochhead, of the Ontario Agriculture College, Guelph, and Prof. W. N. Hutt, of the Agricultural College, Logan, Utah. Prof. Lochhead, finding that the inspection had become too burdensome to be combined with his college work, handed in his resignation early in 1902, and Mr. W. N. Hutt, then Assistant Inspector, was appointed to the position. Mr. W.N. Hutt conducted the spring inspection with great thoroughness and ability, visiting each nursery personally, testing the houses and ordering improvements where necessary. In September he resigned the Inspectorship to accept the office of Professor of Horticulture at the State College of Agriculture in Utah. Your present Inspector entered on the work the same month, and immediately started on the fall campaign which was completed early in November.

LAST YEAR'S WORK.

The past year has been a very favorable one for the spread of the San Jose Scale, the frequent rains rendering successful spraying very difficult, and encouraging the less energetic fruit-grower to neglect such precautions altogether. The condition of the infested districts is still serious, for while the report of the San Jose Scale Commission has shown that the pest can be held in check, if not eradicated, by the use of suitable spraying mixtures, yet, unless all the orchard, ists in the infested districts unite in such work, very little can be accomplished As long as the scale is thus prevalent, the fumigation of nursery stock must be very strictly enforced. At present, the scale is confined to two or three comparatively small areas, but such is the rapidity with which it multiplies that one season's neglect of the present precautions would likely see it established all over the Province.

The nurserymen have accepted this condition of affairs, and have, during the past year, heartily co-operated, in almost every case, with the Department of Agriculture in the carrying out of the regulations in regard to the fumigation of stock. Some delay was caused in a few instances through the neglect of the nurserymen to prepare their houses for the visit of the Inspector. Ample notice will be given during the coming season of the probable date of inspection, and the nurserymen are cautioned that it will be impossible for the Inspector to pay a second visit to any point. Another practice, which must be discontinued, is the delaying on the part of the nurserymen to order chemicals, and then expecting to be allowed to purchase the necessary preparations through local firms. As it is impossible for the Inspector to have these small quantities properly tested, the nurserymen are again warned that such practices will hereafter be strictly forbidden.

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Great caution should be exercised in the proper labelling of the boxes, especially in shipment to outside Provinces. The laws regarding the entry of unfumigated nursery stock, both in the Maritime Provinces and in British Columbia, are very strict, and failure to fulfil these laws will undoubtedly result in the complete loss of the trade in these Provinces. To show how careful their inspection of our Ontario stock is, I will mention a case which occurred last spring. A certain firm inadvertently shipped to Nova Scotia two cases of trees without attaching the label showing that the stock had been subjected to the usual fumigation. Word was at once sent to this office asking if the stock at that nursery had been properly treated with the gas; if not, the shipment would be destroyed. Fortunately for the consignor, it was carelessness on the part of the workmen in simply neglecting to attach the label, but such carelessness might cost the Province of Ontario a great deal. The following extract from the letter referred to will show that the Nova Scotia fruit-growers are in earnest: "For the most part the nursery stock from Ontario seems to be well fumigated, but if any trees are allowed to leave Ontario for Nova Scotia without perfect fumigation, our growers will unanimously prohibit the whole business."

Spring Inspection.

Mr. Hutt started out for Niagara Falls on March 20th, and inspected thoroughly the houses at the nurseries throughout the Niagara district. In most of the buildings slight alterations were necessary, generally in the fitting of the doors and ventilators. As most of the houses were built without stone foundations the effect of the winter's frost in heaving and twisting the ground supports was everywhere evident, and the cost of refitting and padding, which will be necessary every spring, would in a few years pay for a stone foundation.

From the Niagara District, Mr. Hutt went west to the Dominion house at Windsor. Through the kindness of the Hon. Sydney Fisher and Prof. Fletcher, both of the Dominion houses at the points of entry were placed again in our hands for inspection. These houses are of great importance, and we are pleased to report that capable men have been placed in charge, viz.: Mr. C. Wright at Windsor, and Mr. O. Garner at Niagara Falls.

Every nursery was then systematically visited from west to east; the houses being tested, alterations ordered if necessary, improvements in utensils, etc., suggested, and plans for new buildings furnished when desired. Over eighty nurseries came under the inspection, and a noticeable change for the better was observed in both buildings and equipment, and in the attitude of the nurserymen towards the process of fumigation. No such hostility as was manifested in previous years appeared. This is no doubt due to the fact that the charges of injury to the nursery stock from the action of the hydrocyanic acid gas has been found to be groundless, and the trouble that arose during 1901 was largely the result of the unfavorable season.

Fall Inpection.

Owing to change of Inspectors, the work was rather late in starting, and the writer did not reach the Dominion house at Windsor till after considerable nursery stock had already passed through. The fumigation here being in charge of Mr. Wright, who is very careful and thorough in his work, your Inspector felt that no infested stock could possibly get into the country through this source.

As by far the greater part of our nursery-stock is spring-planted and leaves the nurseries at that season of the year, the fumigating houses are not used to the same extent in the fall as in the spring, and in many of the smaller nurseries, no stock whatever is dug for fall shipment. Such being the case, the work of

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inspection in September and October of the past year was comparatively light In all, twenty-two houses were visited and subjected to the usual tests. Of this number, six had been almost entirely rebuilt, and four were plastered throughout. Two of the nurserymen promised to replace old houses with modern structures in the spring of 1903, and in each case they were advised by your Inspector to finish them inside with lath and plaster. The two illustrations show a very good house on the nursery of Smith & Reed Co., St. Catharines. This house was constructed with double walls, etc, in the first place, but Mr. Reed finding difficulty in keeping it gas-tight, had it lathed and plastered last year. The lower illustration shows the method used to protect the plaster from injury while the stock is being put in or removed.

Injury to Nursery Stock.

In the report of the Inspector for 1901, page 12, mention is made of a series of experiments which were begun in November, 1901, under the supervision of Mr. W. N. Hutt, then Assistant Inspector, on many kinds of nursery stock, —peaches, apples, plums, currants, cherries, and roses. These experiments were intended to settle definitely the question as to whether any injury to nursery stock resulted from the fumigation with hydrocyanic acid gas. Prof. Lochhead had himself experimented on a lot of forty-one trees in the fall of 1900, and as shown on page 12 of the 1901 report, could find no ill effects whatever from the gas treatmen·, even when double the normal dose was used. The trees received no special care beyond that their roots were exposed as little as possible, and were planted in the fall when conditions are perhaps not so favourable as they are in the spring. Yet they came through all right without a single loss.

Not satisfied with this small experiment, Prof. Lochhead asked Mr. Hutt to carry on along the same lines, work with larger numbers of trees in every case. The trials were carried out in duplicate, one set of stock being planted in Southend, the other in Winona. The following varieties were used in these tests:

Apple—Ben Davis, Baldwin, 16 trees.
Peach—Fitzgerald, Elberta Banner, Leamington No. 1, Triumph, Solway, Barnard, 56 trees.
Plum—Lombard, Abundance, 16 trees.
Pears—Varieties unknown, 16 trees.
Cherry—Dye House, Pickering, Black Ox Heart, 24 trees.
Grapes—Vergennes, 8 vines.
Blackberry—Gainor, 16 bushes.
Currant—Fay's Naples, 16 bushes.
Althæa—A. Variegata, A. Jean D'Arc, 8 bushes.
Rose—Crimson Rambler, 8 bushes.

Of these trees and shrubs, part were treated in a large nursery fumigating house, and came through with the ordinary run of nursery stock during the fall digging; the remainder received special treatment in a box fumigator of 92 cubic feet capacity, and were treated under varying strengths of gas as follows:—

One-half strength	3·8 oz. Cyanide.	Double strength	1 1-2 oz. Cyanide.
	3-5 oz. Acid.		2 2-5 fl. oz. Acid.
	7-8 oz. Water.		3 1-2 fl. oz. Water.
Two-third strength	1-2 oz. Cyanide.	Treble strength	2 1-4 oz. Cyanide.
	4-5 fl. oz. Acid.		3 3-5 fl. oz. Acid.
	1 1-6 fl. oz. Water.		5 1-4 fl. oz. Water.
Normal strength	3-4 oz. Cyanide.	All per 100 cubic feet air space.	
	1 1-5 fl. oz. Acid.		
	1 3-4 fl. oz. Water.		

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These latter experiments were to test the varying doses on both scale and plant, and with these ends in view, trees were treated with and without foliage, and also wet and dry. In all cases check lots were left unfumigated.

The results showed no appreciable difference between the trees and shrubs under varying strengths of gas or between treated and untreated specimens. The spring of 1902 was very cold and wet, and all classes of nursery stock leafed out slowly, and as a rule several days later than in previous years. In this respect, as said before, no difference was noted between treated and untreated trees. Absolutely no injury whatever resulted from the use of the normal dose to any of these varieties, including the peaches, cherries, and Japan plums which were thought specially susceptible to injury from the gas.

Prof. W. N. Hutt writes as follows in regard to these matters:—"I have been making very close observations upon the trees treated and untreated by fumigation. Last fall I had an opportunity of carrying on during the whole fumigation season, a series of very extensive experiments covering all kinds of nursery stock, treated under the varying conditions in which they were found in the nursery, and treated with varying doses from half to three times the ordinary dose. The stock treated covered the whole range of nursery trees and plants, from the largest ornamentals to the smallest grape vines and berry bushes. These were set out in the spring in duplicate lots, and observations taken on them from time to time as growth started. I saw them on May 29th, and to my surprise, found them all in uniform condition, both those untreated, and those treated with double and treble the dose. This experiment covered the whole range of nursery stock, including apples, pears, peaches, plums, cherries, grapes, blackberries, currants, roses, and ornamentals. Every variety of stock seemed to tell the same story, there being no difference in the budding out or general appearance of the trees from those untreated to those treated with double and treble the dose. I pointed this out to several prominent nurserymen who inspected these experiments, and they agreed with me, that there seemed to be not the slightest appearance of any injurious effect from the gas.

"However, one point was quite marked, and that was that all the peach stock was alike dry, both fumigated and unfumigated, thus showing that the dry condition of the stock was not due to fumigation, but apparently to the tenderness of the stock towards digging, handling and general exposure. Moreover, I may say that this is corroborated by many other nurserymen and dealers with whom I have been talking. We well know that certain kinds of nursery stock are delicate towards handling, and are difficult to transplant successfully, and the peach is probably the most tender of this class. I am more than sanguine from the results of my experiments that fumigation, if properly done, has not the slightest injurious effect on the tree."

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INSTRUCTIONS SENT TO NURSERYMEN.

The following circulars were sent out in the spring:—

Memo. for the Guidance of Nurserymen in the Fumigation of Nursery Stock.

READ CAREFULLY AND PRESERVE.

1. The *Formula* to be used for *Apple, Pear, Plum, Cherry, Quince, Shrubs and Vines.*
   - *Cyanide*—Twenty-five twenty-eighths of an ounce.
   - *Sulphuric Acid*—1¼ fluid ounces.
   - *Water*—1⅞ fluid ounces for every 100 cubic feet in house or box.

2. The *Formula* to be used for *Peach, Raspberry, Gooseberry, Currant.*
   - *Cyanide*—⅔ ounce
   - *Sulphuric Acid*—1 fluid ounce.
   - *Water*—1½ fluid ounces for every 100 cubic ft. in house or box.

3. The following plants do not require fumigation: *Evergreens, Strawberry Plants, Bulbs and Tubers, Herbaceous Perennials,* and *Bedding Plants.*

4. Damage may be done to stock *(a)* if fumigation takes place too early in the fall, before the buds are set, and the wood sufficiently dormant; and *(b)* if fumigation takes place late in the spring, after the buds have begun to swell.

5. The roots of stock should be exposed for as short a time as possible, both before and after fumigation. Experience shows that much injury has resulted from such exposures.

6. No nurseryman shall use chemicals other than those sent from the Guelph Agricultural College, except by special permission of the Inspector.

7. Nurserymen should bear in mind that a certificate of fumigation must be attached to every package of nursery stock sent from the nursery.

8. No fumigation house is to be used for fumigation purposes until sanction has been obtained from the Inspector.

REGULATIONS FOR THE FUMIGATION OF NURSERY STOCK.

The following regulations have been prescribed by order of the Lieutenant-Governor-in-Council, in accordance with the provisions of the *San Jose Scale Amendment Act,* passed April 1st, 1899:

1. Fumigation must be carried on in a box, room, compartment or house suitable for the purpose, which must be air-tight and capable of rapid ventilation. The owner or proprietor will notify the Minister as soon as preparation for fumigation is complete. The Minister will thereupon order an inspection of the fumigation appliances. No fumigation under the Act is to be carried on until such inspection has been made and a satisfactory report sent to the Minister.

2. The Inspector, after examining and measuring the box or house, or other compartment in which fumigation is to be carried on, will prescribe the amounts

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of material to be used for every fumigation, and the instructions as to the same must be carefully followed out. The Inspector may, if thought advisable, supply the material for each fumigation in weighed packages.

3. The fumigation house (which shall include all apparatus or appliances used in the fumigation, such as generators, etc.) is to be subject to the orders of the Minister on the recommendation of the Inspector. Subject to the approval of the Inspector, the fumigation house may be on other lots than those on which the nursery stock is growing.

4. The fumigation is to be by hydrocyanic acid gas, produced according to the instructions of the Inspector, and from such formula as he prescribes for the purpose.

5. The fumigation is to be continued for a period of not less than forty-five minutes. After the expiration of this time or longer, and when fumigation is complete, the house is to be thoroughly ventilated for fifteen minutes at least.

6. No person is to be allowed to enter the fumigating house until after the ventilation period has expired. Entering before may prove injurious, if not fatal, as the gas is a deadly poison.

7. The fumigation of buds and scions, may be done in fumigation boxes of not less than thirty cubic feet capacity, the same to be subject to inspection and approval.

8. Immediately after inspection of the fumigation house, the Inspector will report to the Minister, and the Minister or Inspector will thereupon give permission in writing for the owner or proprietor to begin fumigation.

9. The owner or proprietor of every nursery will attach to every box and to every package of nursery stock a certificate as follows, and he will furnish every purchaser who so desires a copy of the same:

CERTIFICATE OF FUMIGATION.

This is to Certify that this package of Nursery Stock, consisting of

_____

_____

was properly fumigated on or about the_____day of_____1902, in accordance with the regulations prescribed by order of the Lieutenant-Governor-in-Council, in accordance with 62nd Victoria, Chapter 35.

_____

_____

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AN ACT TO PREVENT THE SPREAD OF THE SAN JOSE SCALE.

61 Vict., Chap. 33, amended by 62 Vict., c. 35, and 63 Vict., c. 129.

1. This Act may be cited as *The San Jose Scale Act*

2. In this Act the word "Minister" shall mean the Minister of Agriculture for the Province of Ontario.

The word "Plant" shall mean any tree, vine, shrub or plant, or any part of a tree, vine, shrub or plant, or the fruit of any tree, vine, shrub or plant.

The word "Scale" shall mean the San Jose Scale insect in any of its stages of development.

3. No person shall import or bring, or cause to be imported or brought into the Province of Ontario, for any purpose whatsoever, any plant infested with scale.

4. No person shall keep, or have, or offer for exchange or sale any plant infested with scale.

5. The owner or proprietor of any nursery shall not send out or permit any plant to be removed from his nursery without the same being first fumigated by hydrocyanic acid gas in accordance with regulations prescribed by order of the Lieutenant-Governor in Council. 62 V., c. 35, s. 3.

6. No person shall sell or dispose of or offer for sale any plant obtained, taken, or sent out from a nursery unless the said plant has previously been fumigated in accordance with these regulations. 62 V., c. 35, s. 4.

7. In case the inspector finds scale in any nursery and so reports to the Minister, the Minister may thereupon inform in writing, the owner or proprietor or manager of said nursery of the existence of scale in his nursery, and the owner or proprietor or manager of said nursery shall not thereafter permit any plant or plants to be removed from the said nursery until he is notified in writing from the Minister that the Inspector has reported to the Minister that it is safe in the public interest to permit the said nursery stock to be removed after fumigation. 62 V., c. 35, s. 5.

8 For the purpose of scientific investigation the Minister may from time to time, by writing given under his hand, except such persons as he may deem proper from the operation of the two preceding sections, and, while acting under such permission, such persons shall not be subject to the penalties imposed by this Act.

9. Any person having reason to suspect that any plant in his possession, or in his charge, or keeping, is infested with the scale shall forthwith communicate with the Minister in regard to the same, and shall furnish the Minister with all such information in regard to the source or origin of the said infestation and nature of the same as he may be able to give.

10.—(*a*) Whenever the scale exists, or is supposed to exist on any plant, the Minister may direct a competent person to make an examination and inspection, and may order that any plant so infested, or such part as he may deem advisable, shall be immediately destroyed by burning, either by the person appointed to make the inspection, or by the person owning or having possession of the said plant, or some other person so directed in writing, and the person so directed shall make a full report to the Minister in writing as to the nature and extent of the work so performed, together with a fair estimate of the value of the plant described.

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(*b*) If, in the case of an orchard or collection of plants, the inspector finds scale on plants located in several different parts of the orchard or collection, and decides that it is advisable in the public interest to destroy all the plants in such orchard or in any part or parts thereof, and so reports to the Minister, the Minister may direct that an examination or inspection shall be made by an additional inspector, and upon their advice in writing he may direct that all the plants in such orchard or such collection of plants or in such part or parts thereof shall be destroyed without requiring that every plant in the said orchard or collection shall be first examined. 62 V., c. 35, s. 2.

11. For the purpose of enforcing this Act, it shall be the duty of every Inspector appointed under *The Yellows and Black Knot Act* to make careful examination for the occurrence of the scale within the municipality for which he is appointed, and to report forthwith to the Minister every case of infestation, and neglect to make such report shall render the Inspector liable to the penalties imposed under section 14 of this Act.

12. Any person appointed by the Minister under this Act to inspect, or to destroy any plant, for the purpose of enforcing the provisions of the Act, shall, upon producing his authority in writing, have free access to any nursery, orchard, store, store-room, or other place where it is known, or suspected, that any plant is kept.

13. Upon the recommendation of the Minister, there may be paid out of the Consolidated Revenue Fund to the Province to the owner of any plant so destroyed a sum not exceeding one-fourth of the value thereof (not including fruit) as reported upon by such officer or other competent person, appointed as aforesaid, but nothing in this section shall apply to any plant imported into the Province within a period of one year prior to the examination by the officer aforesaid.

14. Any person neglecting to carry out the provisions of this Act, or any person offering any hindrance to the carrying out of this Act, shall, upon summary conviction, be liable to a fine of not less than $20 nor more than $100, together with costs, and in default of payment thereof shall be subject to imprisonment in the common gaol for a period of not less than ten days nor more than thirty days.

15. The Lieutenant-Governor in Council may by order direct that other scale insects than the San Jose Scale may be included in the provisions of this Act, and thereafter during the continuance of such Order-in-Council the word "Scale" in this Act shall include all such other scale insects. Public notice of such Order-in-Council shall be given by publication in two successive issues of *The Ontario Gazette*.

16. Notwithstanding anything contained in *The San Jose Scale Act*, and the amendments thereto, the Lieutenant-Governor in Council may, upon the recommendation of the Minister of Agriculture, adopt regulations for the treatment of infested plants by spraying, washing, or fumigation. These regulations shall be published in two successive issues of *The Ontario Gazette*, and such treatment may be allowed or authorized in the manner prescribed in the said regulations in place of or prior to destruction by burning as provided for in section 7 of the said Act. 63 V., c. 46, s. 2.

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AMENDMENTS TO THE SAN JOSE SCALE ACT.

Assented to March 17th. 1902.

1. Section 4 of *The San Jose Scale Act* is amended by adding the following sub-sections:

(1) All persons owning, leasing, or managing any orchard or collection of plants, other than a nursery, shall, when any plant therein becomes infested with the scale, and forthwith on becoming aware, whether by notice or otherwise, of such infestation destroy such plant by fire, or shall effectually treat the scale by fumigation, or by spraying with crude petroleum, kerosene or soap, or by any other material prescribed by the Minister.

(2) The council of any city, town, township or incorporated village may, and upon the petition of fifteen or more ratepayers shall, by by-law, appoint at least one inspector to enforce the provisions of this Act in the municipality, and fix the amount of remuneration, fees, or charges he shall receive for the performance of his duties. All such appointments, as well as such remuneration, fees or charges, shall be subject to, and be only operative on the written approval of the Minister, communicated by him to the clerk of the municipality.

(3) Every inspector appointed by any by-law passed under sub-section 2 of this section is empowered to act as inspector under *The Yellows and Black Knot Act* and under *The Noxious Insects Act* in all respects as if he had been appointed as inspector under the last mentioned Acts by by-laws specially passed for that purpose.

(4) All such inspectors appointed shall be subject to and observe the regulations and directions of the Minister, and shall be subject and subordinate to the inspector appointed by the Minister, and in case of any neglect of duty, such inspector shall be subject to the penalties prescribed by this Act

(5) The council of the city, town, township or incorporated village shall pay the remuneration, fees or charges of such inspectors, and shall be entitled to receive from the Department of Agriculture one-half of the amount so paid, upon furnishing the department with statements of the sums so paid, certified to by the inspector appointed by the Minister.

2. Section 12 of the said Act is amended by adding after the word "Act" in the third line of the said section the following words, "and any inspector appointed by the council of the municipality."

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CHEMICALS.

The chemicals used in the work during the fall were sent out direct from the wholesale house in Toronto instead of as formerly from the Ontario Agricultural College. The same plan will be pursued this year, and nurserymen should write direct to the Inspector, at the Parliament Buildings, Toronto, to insure a prompt response to their requests for cyanide and acid. As the chemicals must be sent by freight in most cases, it is imperative that the orders should be sent in early.

The following points mentioned by Professor Lochhead in previous reports should receive more careful attention from the nurserymen:

1. Never allow a tree grown by you to get out of your nursery before it is fumigated.

2. Do not fumigate the trees until the wood is well matured and the buds thoroughly dormant.

3. Never fumigate trees after the buds have begun to open in the spring.

4. Never expose the roots of trees longer than is absolutely necessary.

5. Send in your orders for chemicals early, and state clearly the number of doses required.

6. Repair your fumigation house early before the Inspector calls.

7. The Inspector will probably begin work about March 15th, and Sept. 15th in the Niagara region.

8. Never leave the cyanide or the acid where children can reach it.

9. Never allow the residue after fumigation to remain long in the crock or generator.

10. Never put a new charge in a generator containing the old residue.

11. Never use tin or iron vessels as generators. They will be rendered useless in a few minutes.

12. Never allow any one to enter a fumigation house under ten or fifteen minutes after the doors and ventilators are open.

13. Never omit to attach the certificate of fumigation to every parcel of stock shipped.

P. W. HODGETTS,
Inspector.

Toronto, 27th Feb., 1903.

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Exterior view of fumigation house.—Dominion Nurseries, St. Catharines.



Interior view of same house showing method of protecting plaster walls from injury while handling the stock.

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A LIST OF THE NURSERIES OF ONTARIO, 1902.

Morris, Stone and Wellington, Fonthill	Fumigation houses, 2,800 cub. ft.
Stone & Wellington, Toronto	do at M. S. & W.
E. P. Blackford & Co	do do
Pelham Nursery Co., Fonthill	do do
B. W. Secord, Fonthill	do house, 750 cub. feet
J. E. Crow, Ridgeville	do house, 560 do
J. W. Page, do	
F. Walker, Virgil	do house, 866 cubic feet.
W. Lee & Son, Virgil	do house, 2,100 cubic feet.
Angus Shaw, do	
E. Morden, Niagara Falls South	do box, 120 cubic feet.
Smith, Reed Co., St. Catharines	do house, 1,550 cubic feet.
Titterington & Co., do	do Smith, Reed Co.
A. G. Hull & Son, do	do house 960 cubic feet.
Alex Glass, do	do do 240 do
Neil Buchanan, do	do by J. J. Collins.
J. J. Collins, do	do house 460 cubic feet.
H. Cawker, do	do do 500 do
Brown Bros. Co., Brown's Nurseries	do do 6,400 do
Chase Bros. Co., Colborne	do by Brown Bros Co.
F. W. Bowman & Son, Toronto	do do
E D. Smith, Winona	do house, 2 300 cub. ft. and box
C. P. Carpenter & Son, Winona	do house, 1,318 do
F. B. Henry, do	do by E. D. Smith.
J. E. Henry, do	do by E. D. S. & C. P. C. & Son.
I. E. Vanduser, do	
Winona Nursery Co., Winona	do by E. D Smith.
Grimsby Nursery Co., Grimsby	do by C. P. Carpenter & Son.
W. Smith, do	do by E. D. Smith.
W. D. Kitchen, do	
Webster Bros., do	do do 240 do
Ward Bros., Bartonville	do do 642 do
Brock Galbraith, do	do house, 320 cubic feet.
Fruitland Nursery Co., Fruitland	do and box, 1,620 and 70 cub. ft.
M. I. Davidson, Burlington	
Caldwell & Co., Galt	do house, 1,300 cubic feet.
H. L. Janzen, Berlin	do box, 90 cubic feet.
M. Milgau, Bright	do house, 1,377 do
E. Hersee, Woodstock	do do 630 do
A. W. Graham, St. Thomas	do box 62 do
H. L. McConnell, Lakeview	do house 400 do
C. A. Baker, London	do do 510 do
D. Dempsey, Stratford	do do 100 do
J. McAinsh, Wellburn	do do 145 do box 52 ½ c. ft.
Strathroy Nursery Co., Strathroy	do do 72 do
Estate of J. Stewart, Goderich	do house 300 do
J. W. Skinner, Mitchell	Evergreens.
Chas. Ellis. Meaford	Fumigation do 475 do
J. H. Wismer, Port Elgin	do do 900 do box 45 c. ft.
W. Fleming, Owen Sound	do do 500 do
S. H. Newman, do	do do 250 do
T. C. Robinson, do	Using S. H. Newman's house.

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NURSERIES OF ONTARIO.—*Continued.*

W. M. Robinson, Kettleby.....	Fumigation house, 300 cubic feet.			
Steele, Briggs Seed Co, Toronto....	do	box	75	do
W. Rennie & Sons, Toronto.....				
J. A Simmers, do				
A. Gilchrist, Toronto Junction.....				
Manton Bros., Eglinton.....				
Granger Bros., Deer Park, Toronto...				
Stanley Spillett, Nantyr.....				
R. Breckon, Toronto.....				
Colin McDonald, Toronto, 1,164 Queen St., East.....	Fumigation house, 305 cubic feet.			
W. L. Clarke, Leamington.....	do			
Thos. Rowley, do	do	house, 875 cubic feet.		
S. Ward Kennedy, do	do	do	600	do
Geo. Cady, Ruthven,.....	do	do	860	do
McKenzie Ross' Sons, Chatham ...	do	do	915	do
F. W. Wilson, Chatham.....	do	do	1,325	do
N. E. Mallory, Guilds.....	do	do	144	do
N. T. Selby, Newcastle.....	do	do	560	do
R. J. Mackie, Oshawa.....	do	do	385	do
L. K. Shourds, Wellington.....	do	do	1,000	do
Wallace Woodrow, Picton.....	do	do	500	do
W. C. Reid, Belleville.....	do	do	190	do
J. W. Johnston, Campbellford.....	do	do		
H. A. McIntosh, Dundela	do	do	72	do
Thos. Dangerfield, Kemptville....	do	do	640	do
W. G. Conn, "	do	do	640	do
Renfrew Nursery Co., Renfrew ...	do	box	96	do
David Tait, Iron Bridge, Algoma..				
Campbell Bros., Simcoe.....				
Hunter & Son, Hawthorne Nurseries, Scotland.				
Chas. Fisher & Son, Fenwick.				

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THIRTY-THIRD ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY

OF

ONTARIO

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
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1903.

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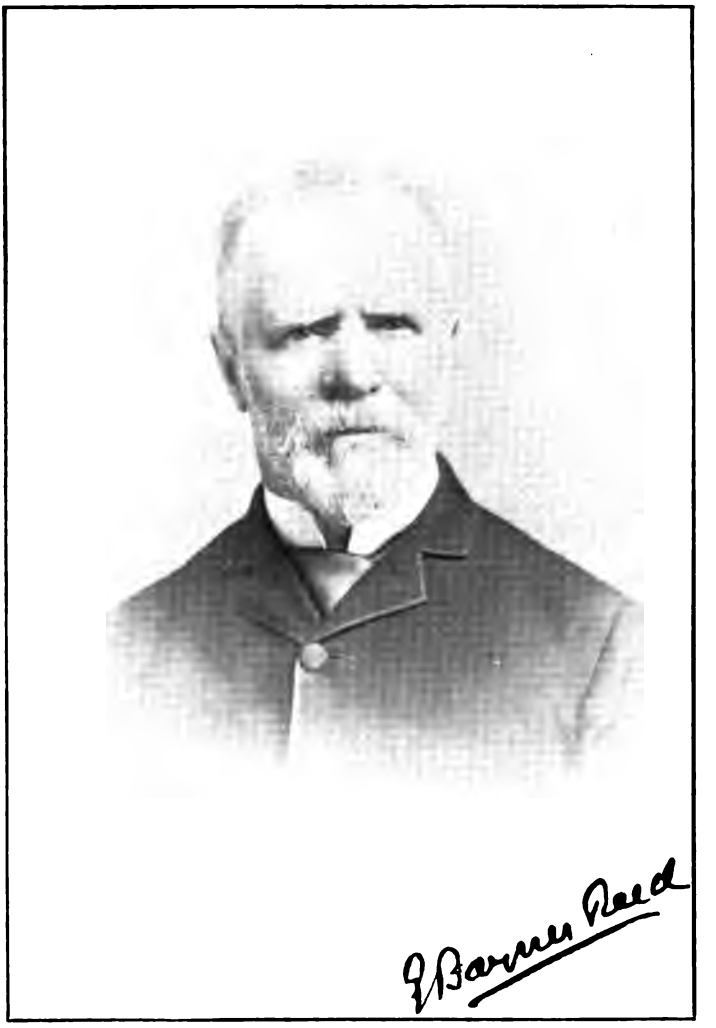
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WILLIAM E. SAUNDERS,
Secretary of the Entomological Society of Ontario from 1887.

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EDMUND BAYNES REED,
An original member of the Entomological Society of Ontario.

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THIRTY-THIRD ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1902.

To the Honorable John Dryden, Minister of Agriculture:

SIR,—I have the honor to present herewith the Thirty-Third Annual Report of the Entomological Society of Ontario.

The Thirty-Ninth Annual Meeting was held in London, on Wednesday and Thursday, October 29th and 30th, 1902. A full account of the proceedings, with the papers read and reports submitted, is given in the following pages. An interesting and important feature of the meeting was a conference on the Pea-Weevil, its injuries to the crop in Ontario and the best means of reducing its ravages.

The *Canadian Entomologist*, the monthly organ of the society, has been regularly issued during the past year, and has now completed its thirty-fourth volume. It continues to maintain its reputation as a scientific magazine of high character.

I have the honor to be, Sir,

Your obedient Servant,

CHARLES J. S. BETHUNE,

LONDON, ONTARIO. Editor.

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THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The thirty-ninth annual meeting of the Entomological Society of Ontario was held in London on Wednesday and Thursday, the 29th and 30th, of October, 1902. The chair was taken by the Rev. Dr. Fyles, of South Quebec, President. Among the members present were Mr. Henry H. Lyman, Montreal; Dr. James Fletcher and Mr. Arthur Gibson, Central Experimental Farm, Ottawa; Mr. Charles H. Young, Hurdman's Bridge, Ont.; Mr. John D. Evans, Trenton; Mr. George E. Fisher, Inspector of Scale Insects, Freeman; Prof. W. Lochhead, Ontario Agricultural College, Guelph; Rev. Dr. Bethune, Dr. Woolverton, Dr. Stevenson, Messrs. J. A. Balkwill, J. H. Bowman, E. A. Browne, J. Dearness, C. J. Fox, C. W. Horton, John Law, J. Alston Moffat, W. E. Saunders, Walter Smith, and other residents of London. The Society was also favoured with the presence of Prof. C. C. James, Deputy Minister of Agriculture for Ontario; Mr. W. L. Smith of the Toronto *Weekly Sun*; Messrs. Thompson and Black of the *Farmers' Advocate*; Mr. Pearce, and other visitors.

Letters expressing regret at their inability to attend were received from Mr. W. Hague Harrington, Ottawa and Mr. E. M. Walker, Director, Toronto; also from Prof. F. M. Webster, Urbana, Illinois.

During the morning of Wednesday, Oct. 29th, a meeting of the Council was held for the transaction of the business of the Society and the preparation of their annual report. It was decided to hold the next annual meeting of the Society in Ottawa in September, 1903. Sheet Cork and Entomological pins were ordered to be sold to members at cost and to others at twenty per cent. advance on cost, and arrangements were made for obtaining a supply of black enamelled steel pins. A resolution was adopted permitting the Ornithological Section to alter its name to "The McIlwraith Ornithological Club (Ornithological Section of the Entomological Society of Ontario)."

In the afternoon the Society met at 2.30 o'clock, the President, Rev. Dr. Fyles, in the chair, and proceeded to discuss the prevalence of the Pea Weevil in Ontario and the best means of controlling its ravages.

THE PEA WEEVIL CONFERENCE.

At the request of the President, Dr. Fletcher, of Ottawa, introduced the subject of the Pea Weevil. The following is a condensed summary of his remarks:

Dr. FLETCHER: Mr. President and Gentlemen. Everyone must have noticed for many years the great reduction which has been gradually taking place in the area of land devoted to the cultivation of Peas. This I find has been almost entirely due to the fact that farmers find that pea growing is not a remunerative occupation, owing to the diminution both in output and the value of the grain due to the attacks of the Pea Weevil. In my own Reports, which reach a considerable number of farmers in the Dominion, I have constantly drawn attention to this injury and the simple means of controlling the insect which causes it, but the loss at the present time is so serious and the pea crop is one of such enormous importance that I feel something more definite than has been done in the past should be done to bring this subject prominently before the country, so as if possible to stir up the pea-growers and seed-dealers throughout the Dominion and in the adjacent United States where peas are grown to join in one great, universal, and co-operative effort. The pea crop is of special value to farmers be-

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cause nothing quite takes the place of peas as feed for pigs. This has a direct bearing, not only upon the pork and bacon trade of the country both for home use and export, but also upon the closely associated industry of dairying. Moreover, it seems to me that the problem now before the country is an exceptionally simple one, and Prof. Lochhead and I have been considering what can be done to change the existing state of affairs. Naturally, in such an important matter we have the keenest sympathy of both the Honourable Sydney Fisher and the Honourable John Dryden, who are most anxious to find out what can be done to protect this important crop. It is for this reason that the Council of the Entomological Society of Ontario have thought it wise to arrange for to-day's conference, so that some steps may be at once taken to arouse interest and also that more energetic measures may be adopted than have been in the past.

The greatest enemy of the pea crop is the Pea Weevil, *Bruchus pisorum*, (Fig. 1), more generally known in trade as the Pea Bug. This insect has been established in Canada as a pest of the pea for a great many years but during the last ten years it has become such a serious enemy that in many of our Ontario districts where peas could be grown some years ago of the very highest quality—of such a high quality indeed that Canadian peas were considered the best that could be produced in all the markets of the world,—farmers have now given up the cultivation of peas altogether, and in many other districts they are now talking of doing the same. Personally, I do not believe that it is necessary to give up the cultivation of peas nor that it would be a wise thing to do so. The crop as I have stated above is one of exceptional value, and I cannot see how this step would be of very much benefit in controlling the insect. It has been suggested—and I may mention that this seems to be the favourite remedy proposed by most people who have written to me,—to stop growing peas for one or two years, and to pass some law by which everyone is prevented from sowing. I do not believe that, if any such legislation were passed, it could possibly be enforced ; for, to be effective, the cultivation of peas would have to be stopped absolutely in every pea field and private garden, both in Canada and the United States. I am quite certain that many would not regard this law and would insist on growing a few green peas for table use, and although every wise gardener who knows how to make the best use of his ground pulls up his vines as soon as his crop of green peas is picked and uses his land for something else, the people who would sow peas in opposition to the law, belong to the class of gardeners who leave their pea vines standing in the garden all through the summer, and upon these a sufficient number of small pods containing weevils would be left to ripen, to destroy the effects of the whole experiment. Many people would openly defy this law and claim that it was absurd, nor would this be much to be wondered at when we see how little informed most of the dealers and pea growers are with regard to the Pea Weevil and the extremely simple means by which this pest can be reduced. Although it is true that many of the large seed merchants have fumigating houses for the treatment of infested peas, many of them, I know as an actual fact, do not use them regularly and one of our large Canadian seed houses even wrote to me that as long as everybody was not forced to fumigate their peas they did not intend to do so, that it was an extra expense and caused trouble with the insurance companies. I believe that instead of legislation the proper course to adopt at the present time, is to provide accurate information with regard to the life history of the insect, the best remedies and the best way to apply them ; then, to distribute this so freely all over the country that everyone interested may at any rate be

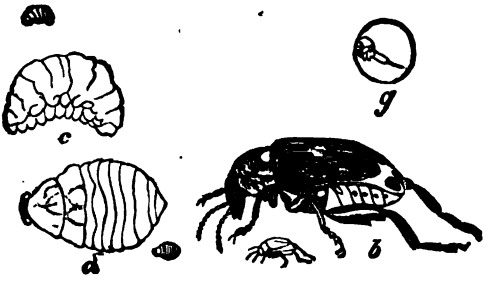


Fig. 1.—The Pea Weevil.

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reminded at the proper time what steps should be taken, and, not only this, but every other citizen of Canada, whether he knows that he is interested or not, should be made to wonder what all the agitation was about.

If all seed merchants would, for their own sakes, give the recognized remedy of fumigating peas with bisulphide of carbon a trial, and sell no peas for seed which they were not certain had been fumigated, and if all growers of peas would refuse and send back to their seed merchants every sample of peas containing living weevils, I feel sure that evident results would be seen in a single year. The problem is extremely simple, but it requires perfect co-operation. There are, of course, difficulties to be met, but I cannot yet find any of these which cannot be overcome. The amount at stake every year which runs into millions of dollars at any rate, makes it worth while for every member of this Society and for everyone connected officially with any agricultural institution, to make a great effort. The state of public opinion at the present moment seems to point out that this is an opportune time to make this effort. In many districts farmers have already practically given up growing peas. There are also indications that, owing probably to the damp cool season of 1902, a larger proportion than usual of the Weevils are passing this winter inside the seed peas and, consequently, could be easily destroyed by fumigating. The magnitude of the loss is now generally recognized, and farmers throughout the country are in a state of nervous anxiety and ready to listen to and act upon any suggestions which commend themselves to their common sense.

The life-history of the Pea Weevil is briefly as follows: The eggs are laid on the young forming pods by the beetles which have wintered over either in the seed peas or about buildings. As soon as the eggs hatch, the grubs eat their way through the forming pod and attack the pea which is nearest to them. They penetrate this, and soon by the increase in the size of the pea every trace of the hole is obliterated. The grub remains inside the pea until full grown, changing to a pupa in July and attaining the fully developed condition of a beetle before the middle of August. According to the season, a larger or smaller number of the beetles leave the peas in the autumn and pass the winter under heaps of rubbish, or secreted about buildings. I think the normal way for this insect to pass the winter is inside the seed peas. The important points to remember in this discussion and which induced me to say that the problem before us is a simple one, are the following: The Pea Weevil is not a native insect, and therefore has not an extensive range of food plants, in which it could live outside the cultivated pea. That plant, which is an exotic, is the only known food plant of the Pea Weevil and occurs nowhere in this country wild or even in a spontaneous manner. All plants which spring up in the field from accidentally dropped seeds are destroyed by our winters, therefore every seed sown for a crop of peas has at some time been in the hands of the grower or seed merchant, where it could have been treated by the well known remedy of fumigating with bisulphide of carbon, which for this insect is a perfectly practical remedy, and by a practical remedy I mean a remedy which is effectual, is simple so that it can be applied without any danger of error, and is cheap enough to make its application a paying operation. It is claimed by some that the chief difficulty in the way of trusting to fumigation as a main remedy for controlling the Pea Weevil is that a sufficient number of peas are shelled out in the field at harvest time to leave insects enough to emerge and infest the following crop, even if all the seeds were treated. To obviate this difficulty, I have recommended a plan which some have adopted to reap their crop as early as possible, as much on the green side as can be done with safety. It is a well known fact that seeds of all kinds reaped on the green side rather than when they are over-ripe, have a higher germinating power. It is certain that they would shell out in the field less, and, if such seed were fumigated at once, the weevils would be destroyed inside them before they had made a very serious diminution in the bulk of the seed. If there should be difficulties in the way of farmers themselves treating their seed at once, which however they are quite easily able to do,

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they should without delay sell to the grain buyers, who knowing the advantage of fumigating early would soon make arrangements, even if they had not these already, to treat the seed so as to get the best sample possible. With regard to those peas which shell out in the field, I cannot see any very great difficulty with these. It is the common practice in the pea growing districts for farmers to turn in hogs after the crop is harvested. These pick up every seed cleanly, and with the assistance of poultry I imagine that few infested peas would be left on the field to carry over the infestation. If thought preferable, these peas could be turned down below the point where the weevils would be able to reach the surface after emerging, by ploughing down the land deeply either in autumn, and of course preferably then, or in spring.

I have here some samples of peas which have been treated at various dates from the end of July until the middle of September. These have been kindly supplied by Mr. W. P. Niles, of Wellington, Ont., a well known seed merchant who deals largely in peas. By examining those fumigated on the 31st July, it is evident that the weevil is at that time very small and that the proportion of the pea which has been destroyed, is much smaller than it is when the peas have been treated only one week later, the grub being at that time not even half grown and only a small amount of the seed being destroyed. From that date on the destruction to the seed is rapid and by the middle of the month of August most of the peas contain full grown larvæ or pupæ. I have here samples of peas grown this year and treated on the 28th August, which contain the fully developed beetles, and it is probable that by the middle of the month in an ordinary year perfect beetles may be found. My recommendation therefore is that farmers should reap early, thresh at once, treat their seed, or sell to others who will, before the middle of August, and never sow a single seed which has not first been fumigated. Talk the matter up whenever an opportunity arises and guard against pooh-poohing the whole matter and saying: "Oh we know all about the Pea Weevil, that's the same as the Pea Bug;" we have always had that, and thereby arguing by inference that they always will have it.

Now I don't believe that there is any necessity for such a valuable Canadian crop as peas, either to be given up or to be infested by the Pea Weevil. I find from the August 1902 Ontario Crop Bulletin that the acreage this year under peas has been reduced from the area sown last year by 70,000 acres, and the yield by 1,274,000 bushels. This is undoubtedly a very serious loss, because certain districts of Ontario are particularly well suited for the production of this cereal. There is evidence to show that many of these districts specially suited to the cultivation of the pea crop, and where peas of the highest quality used to be grown, cannot now produce paying crops of peas owing to the depredations of the Pea Weevil. There are, however, many districts, as for instance the upper Ottawa country and other northern districts, where paying crops of peas are being or could be grown, and the passing of legislation forbidding the cultivation of peas over the whole province would therefore be a hardship. There is another point which may be referred to. It is frequently claimed by dealers that peas which have been injured by the pea weevil are just as good for seed as perfect seeds. This is manifestly nonsense, but, to be in a position to prove this, I have in several seasons experimented by sowing infested seed and taking careful notes on how many plants grew and what was the vigour of these plants. During the past season I planted several rows of early peas which had been bored by Pea Weevils. The average number of these seeds which grew and produced seed bearing plants was 7. and of these some were weakly. This is rather a lower average than has been obtained in previous years, but it was what the season of 1902 showed. It has been found by many experiments made by botanists at Washington and at Agricultural Colleges that large seeds of plants, as a rule, produce more vigorous plants than small seeds. Much more would this be the case where nature had laid up in a seed a certain amount of food to feed the embryo plantlet in that seed, and subsequently a large proportion even to one-fourth of its bulk was accidentally taken.

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away, as in the case of peas injured by the weevil. In the many cases where the germ is destroyed by the weevil, of course no growth takes place at all.

This question of controlling the Pea Weevil in Canada is one which concerns everybody. It is not with the large seed merchants and big houses with which most danger lies but with the individual farmer and private individual who grow a few seed peas for their own use and do nothing to destroy the weevils in them before sowing. As I have stated, there are easy remedies which are available for all, such as holding over the seed till the second year, or treat it with coal oil, using one gallon to 20 bushels; but the best remedy consists in fumigating with bisulphide of carbon, and a farmer who has only five bushels of seed can fumigate this at the expense of a few cents by putting the five bushels in an ordinary coal oil barrel and then placing (either in an open dish on the top or by pouring the liquid straight upon the seed) one ounce of bisulphide for every hundred pounds of seed. A bushel of peas weighs about 60 lbs, therefore the five bushels would require three ounces. The barrel must be closed up tightly and left in an open shed away from other buildings for 48 hours. The bisulphide is a liquid with a very objectionable odour which vaporizes quickly at the ordinary temperature of the atmosphere. The vapour is heavy and quickly runs down through the peas, and, as it is exceedingly deadly to all forms of animal life, every insect in the peas will be killed. The unpleasant odour of the chemical is very soon dissipated when the peas are exposed to the air, and the value of this treatment is that not only are the infesting insects destroyed with certainty but this without injury to the seeds either as to their wholesomeness for food or as to their germinating quality for seed. If it is thought that there is any danger in using such an inflammable material as bisulphide of carbon or there is any hesitancy, as is sometimes the case in using a remedy with which farmers are not familiar, there is always at any rate available the old and well tried remedy of holding over the seed for two years, by bagging the peas immediately after threshing. If this is done with early harvested and threshed peas, not a single weevil can escape, for it has been proved that these cannot eat their way out from a bag of cotton, or even of paper, and all weevils which issue in the bags must die. A very rare instance is on record of a weevil living over in the seed until the second year, but this is such a rare exception that it need not be considered and does not amount to a proportion of one in many hundreds of millions; indeed is so rare that I do not know of a single instance where it has been authoritatively confirmed.

One of the largest seedsmen in Canada tells me that he has to send to Germany to get his peas grown. And we have competition to-day in the London market. Indian peas shipped from Calcutta are being sold at a few cents cheaper than we can get them to the London market, and they are as good as our best peas; therefore, our trade is in danger, and it is important that we should wake up at once and save this crop, which I believe can be saved if we will only go about it in the proper way.

Every letter I have received and every seedsman I have consulted, have agreed that public attention should be drawn to this matter. I have correspondents in all parts of the country, and all say it is a most important matter and requires immediate attention. There is no Society that can draw attention to it better than the Entomological Society. The seedsmen I have consulted, are of the opinion that, if the suggestions given above were adopted, a large reduction could be made in a very short time in the increase of this insect.

The acreage of peas is now reduced very low. It will not be increased very much next year, so that we have an opportunity to start now to draw public attention to this matter. Professor Lochhead and I have been corresponding about the subject for a year, and there is no doubt about it that the Federal and Provincial Governments will do all they can to draw public attention to the matter and to help in every possible way to get rid of this pest.

The Grass Pea, which has been suggested as a substitute for the field pea, has not proved as great a success as was hoped. It is not a pea, though it is considered a pea for many purposes,

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but it belongs to the Genus *Lathyrus*. The pea is a *Pisum*. *Lathyrus* is another plant altogether, and that is the reason probably why the Grass Pea is free from the attacks of the Pea Weevil. It is a very late maturing pea, and I am sorry to say that those who planted it this year, owing to the late season, were disappointed in its growth, because it is a plant which comes from India; for that reason this damp moist season did not mature it, and it was not a paying crop. Vines which bore ripe peas in September, had as much of the vine covered with green leaves and flowers, as there was with the ripe peas. In the St. Catharines and Niagara Districts it has been grown to some extent. Most of the seedsmen are not in favor of the Grass Pea. I would not say, "Do not grow it," because, where the Pea Weevil prevents the growth of the proper peas, the Grass Pea forms a substitute which is comparatively valuable. There are difficulties in harvesting it, and the seeds are thought to be very hard, therefore, some farmers do not like it, but that can be overcome by crushing them with machinery.

I shall not take any more time now, but I shall be very much obliged if any one else would give us their ideas, either on what I have said or upon matters which I have left unmentioned. I have letters here from some of the leading seedsmen in Canada, saying they would have liked to be at this meeting, if they could have made arrangments. I am pleased that Professor James is here with us, and that Mr. Smith is here from Toronto, for the *Weekly Sun*, and Mr. Black from the *Farmers' Advocate*.

Prof. LOCHHEAD: Mr. President. The Pea Weevil is one of the greatest enemies of the farmer of Ontario to day. Before coming here I secured from Professor James the difference in the amount of seed grown in the year 1891 and 1902. The crop in Ontario in 1891 was eighteen and one half million bushels; in 1902 eleven and one half million bushels. That shows a decrease of seven million bushels in ten years; that itself is sufficient to direct serious attention to the subject.

Dr. FLETCHER: What is the average value of a bushel of peas, Mr. Pearce?

Mr. PEARCE: It is now about 60c. for field peas.

Dr. FLETCHER: I average it from 70c. to $1.00 taking the common peas and the high class.

Mr. PEARCE: That would be about right for the high class.

Dr. FLETCHER: It is a loss, at any rate, of between $5,000,000 and $7,000,000.

Prof. LOCHHEAD: The pest is known in the northern counties and all along the shore of Lake Ontario. This summer I visited North Grey, and I found that the farmers in that district were seriously disturbed over an enemy that was new to them—so new that they did not know what it was. This was the Pea Weevil. I was travelling through the County on Farmers' Institute work and I gave two lectures a day on the Pea Weevil. This summer I had the pleasure of going up through Manitoulin Island and as far as St. Joseph's Island; no Pea Weevil exists there, and we saw beautiful crops. I have no doubt that Manitoulin Island is well adapted for pea growing, and I told the people up there that they had a great opportunity of making their island as famous for seed peas as the Jersey people had made theirs for Jersey cattle. If they would keep the Pea Weevil out, they might make it a reserve for growing pea seed. On St. Joseph's Island I found a good illustration of the fact that the Pea Weevil does not exist there. I spent one morning going through pea fields. One farmer told me he had imported some seeds and when they came the bag was literally alive with the Pea Weevil; however, he sowed the peas but took the precaution to sow about five times the normal amount per acre, and he had a good field of peas, I could not find a single weevil in the whole morning's examination of the growing crop. It showed conclusively that this year, at any rate, the pea weevil does not thrive in St. Joseph's Island.

With regard to the point which Dr. Fletcher emphasized very strongly, that the pea-weevil does not reach its full size when the pea is harvested. I was unable to make an exam-

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lination to any great extent, but I asked several farmers who were interested in the Pea Weevil to make an examination. Probably some of you know Mr. Lick of Oshawa, an up-to-date farmer. I asked him what in his opinion was the best time to treat peas and he said that in order to answer this question it is necessary to ascertain at what stage the crop was harvested; he found that not more than one-half the damage was done until after the crop was harvested, and in many cases not more than a third of the damage was done before the pea reached maturity; this was true of both the early and late varieties. He found a large percentage of the early crop was "buggy," and these were his conclusions: "Don't sow 'buggy' peas without treating the weevil. Harvest the crops as soon as ripe and thresh at once; for seed peas fumigate at once; if for feed, grind the peas up and so kill the weevil."

With regard to the number of weevils that germinate, Dr. Fletcher has given you his results, and you will also find them in his Reports. Mr. Zavitz, of the Ontario Agricultural College, also made experiments some years ago, and found in the case of the large variety of pea such as the Marrowfat, that three-fifths of the peas that had been entered by the weevil did not germinate. In the case of the small variety of peas such as the Golden Vine, he found only 13 per cent germinated.

I do not see any other way of treating the Pea Weevil except the method Dr. Fletcher has described; I should like, however, to suggest another way by which we may reach the people. There is nothing like an object lesson. While we may do our best through the agricultural papers and reports of all kinds experience has shown that a great many people will not act; they simply say they will not be bothered, and will grow enough peas for themselves, and not care whether they sell any or not. These are the kind of people we want to influence, as well as the larger growers. We do not know just exactly how far the Pea Weevil will fly; I do not think they will fly much farther than from one farm to another. Mr. Pearce tells me that down in Elgin, in two sections that were separated by a woods, the Pea Weevils were in one section for many years but did not appear in the other section until they got in through the sowing of weevily seed; I am of the opinion that the chief way in which the insect is dissem inated is by sowing weevily peas. I would suggest that help be obtained from the Government for a series of experiments. First secure a good man to act as foreman or manager of the whole experiment and let him appoint a corps of assistants. These men he could train himself, and they should be able to fumigate properly, and then I should choose a section of country of two or three townships, and have these sections scattered in different parts of the Province so as to form as many object lessons as possible, a concession or two concessions might be allotted to each man. Every farmer should be interested in the matter and got to provide a pen, or coal-oil barrel, or box, in which to fumigate, the government might provide the material. I would have these men go systematically down the concession at harvest time and see that the peas are threshed immediately, and then fumigate them for the farmers. It might probably be necessary to fumigate twice. The men would not need to stay very long in one place. If the farmer had already prepared the pens, he could fumigate in an hour, and then go on to the next farm, and return and ventilate them after forty-eight hours. I think one man could in that way arrange for the fumigation of three or four concessions, and a couple of men could do a township.

A great many people do not believe in the entire efficiency of this remedy, and if we can get to their farms, and kill all the weevils, we shall soon convince them of its efficiency. This is a simple suggestion and I should like the members to discuss the matter.

Mr. FISHER: We live in Burlington and we formerly grew peas but of late years we have abandoned them altogether. I have always held that the appearance and the disappearance of the Pea Weevil coincided with the change of temperature. If we had a very low temperature during the winter the Pea Weevils were destroyed.

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Dr. FLETCHER : What is your idea about the Grass Pea taking the place of the peas ?

Mr. FISHER : We grow the Grass Pea somewhat extensively. It is not infested with the bug, and we can grow it without the weevil ; I do not know any reason why it should not be grown. I would very much rather have the ordinary pea because the Grass Pea is a very difficult thing to cut. The vine is hard and wiry and dulls the tools that you use in cutting it, very quickly.

Dr. FLETCHER : How does it ripen ?

Mr. FISHER : I do not think there is very much trouble about their ripening. We sow them about the time we sow the other peas. My experience in growing peas has been that the early-sown peas are altogether the best. I sowed a large field once in a snow storm and had a very superior crop. What is your opinion as to a cold winter killing the Pea Weevil ?

Dr. FLETCHER : It is supposed that it does to a large extent affect them and that is the reason that the area of destruction has been so limited in Canada. I do not think it will kill them sufficiently to consider it a remedy.

Prof. LOCHHEAD : I tried an experiment some years ago. I exposed some of the weevily peas to a temperature of 20 below zero, and in every case the weevil was killed.

Dr. FLETCHER : It was not so with us, at 15 degrees below zero we exposed them in a glass bottle, and thought they were all dead, but in half an hour afterwards they became lively again.

Mr. FISHER : At what time do they mature ?

Dr. FLETCHER : If the peas are left in the field too long, there are enough shelled out to carry the weevil over. The weevil matures about the middle of August. Peas fumigated by Mr. Niles of Wellington on the 5th of August had the weevil about half grown. In very early seasons the Pea Weevil has been found during the first half of August. That is a very rare thing. On the 5th of August this year the weevil was only half grown ; on the 15th of August it was more than half grown, and by the end of August the weevil was in a perfect state. Peas left in the field are certaintly a great source of danger ; they should receive special attention either by feeding them off or ploughing them down deeply.

Dr. FYLES : Do you suppose that the weevil leaves the pea on approach of winter ?

Dr. FLETCHER : They may do so. A considerable number of them leave the peas in the autumn, and they hibernate around the barn or in the rubbish heaps, and a great many of them are killed during the winter.

Mr. FISHER : It is the practice of some fruit growers to work their orchards up to the middle of July, and then sow peas, and they usually get a crop. Where I live the peas will ripen if sown in the middle of July ; the peas will also gather nitrogen and increase the fertility of the soil to a considerable extent. We also keep hogs there and if we turn a hundred hogs on twenty acres of peas in the middle of July, we find that the hogs do very well in cleaning up the pea crop and the apples that fall. They serve the double purpose of freeing the orchard from pests that infest the fruit, and of making pork.

Dr. FLETCHER : That is an excellent practice. There is no doubt that these peas would be practically free from weevil attack when sown so late, but the crop would be reduced by mildew. I should like to ask Mr. Pearce if it is not a general practice here to sow as early as possible ; because if sown late they will be affected with mildew.

Mr. PEARCE : Yes, that is the experience with farmers in this section ; late sown peas are subject to mildew, but they are freer from the weevil. A good many of the farmers here sow them on the 24th of May, but the earlier they are sown the better,—the better the sample you get, and the better the yield.

Prof. JAMES, being asked to say a few words on the subject, said : I certainly cannot add anything to what Prof. Lochhead and Dr. Fletcher have told us as to the nature of the trouble,

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but I can emphasize what they have said regarding its extent. I think the evil of the Pea Weevil is co-extensive with the crop. I do not mean that it is co-extensive with the possibilities of the crop, yet there are very few sections where the pea is grown where you do not find the weevil. There are sections where the pea can be grown where you probably will not find the weevil for some time. We have been told about Manitoulin and St. Joseph Islands. Their contributions of peas to our general crops are very small, and I think at least ninety per cent. of the peas that are grown to-day are grown in weevil-affected sections. When you get to the remote sections, where peas play an unimportant part, you do not find any weevil, and I may say the finest peas I have seen in this Province came from the Temiskaming section. They were beautiful, perfectly grown peas, and there is no doubt we have, away in the east and up the Ottawa valley, sections where peas can be grown extensively for a time. The trouble is that where the great bulk of our peas are grown we have the weevil to an enormous extent, and if we give up growing peas because the weevil is here, it would mean that we have been beaten. We have never yet been brought to that position, and if we give up the fight of the weevil, we might as well retire practically from Agriculture in this Province. The weevil can be kept in check, and the whole question now is, how are we going to convince the farmers that they ought to help us in checking this evil. This is the problem that is before us, not only in connection with the Pea Weevil, but in connection with very many other things; to try and prove to the farmers, and a great many others in the Province, that they ought to do certain things in their own interest. On the face of it, it appears to be a very easy matter to say to the farmer, here is a way you can get good seed peas, and then to expect them all to drop into line and do it at once. But that is the greatest difficulty we have to contend with. There is very little use passing a law, that they must do so and so, because you cannot enforce a law unless you have public opinion at the back of it. Something must be done, and something is going to be done, and I hope we shall get here to-day some practical suggestions that will help us to solve this problem. It is certain that both the departments at Ottawa and Toronto will spend what money is necessary to fight this evil, if we can only see some possibility of success ahead.

The pea crop is a unique crop in the Province of Ontario. It is one that we cannot dispense with. It cannot be measured by the number of bushels we produce, because along with it is another great industry, that is the pork and bacon business, which to a great extent depends upon the pea crop; for to the pea crop and to the dairy industry of this Province we owe to a large extent our success in the pork and bacon industry.

Dr. FLETCHER said that there are large districts still in Ontario where there is no danger from the weevil. Peas have been sown from Newfoundland and Prince Edward Island, and occasionally these peas have, to a very small degree, been infested, but not to any extent. I think that in the case of the San José scale it will spread from its centre. The San José scale started in California, was then introduced in the Eastern States, gradually spreading from its centre, and if it had not been for the active measures adopted by the Ontario Government it would have spread throughout the Province more than it has, and the people of the Dominion ought to recognize what has been done by the Province to save them. They grow magnificent peas in Quebec, and they stopped because the crop fell off. They had been in the habit of specially treating their land to put back what they had taken from it. They stopped this and then their pea crop fell off. Some people connected with the trade find it necessary now to send to Europe to have their seed grown, and we shall lose our trade unless we wake up.

The CHAIRMAN: I think the way to reach the people would be for the Government to issue bulletins.

Prof. JAMES: They have had the information a dozen times through bulletins; they get it year after year.

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Dr FLETCHER: Mr. Carruthers has written me as follows:—"One of our largest buyers writes us that they are getting shipments from Calcutta and the quality is very fine, being free from bugs, and better than any we are shipping him from Canada. They also say they are buying them at one shilling per quarter, which is equal to 3c. per bushel, less than we are asking for our No. 2 grade of the present crop."

Dr. FLETCHER then moved the following resolution, seconded by Prof. Lochhead:—

Resolved, That the Entomological Society of Ontario request that the Superintendent of Farmers' Institutes have the matter of the Pea Weevil brought prominently before all meetings of Farmers' Institutes during the winter; that from the discussion held this afternoon, the cessation in the cultivation of peas for two years is not the best remedy for preventing injury by the Pea Weevil, but rather the making known as widely as possible the nature of the pest, the extent of its injuries and the best remedies, and that if object lessons could be given throughout the country showing the way to fumigate peas and the advantage of doing so, it would materially help to reduce the injury by the weevil.—*Carried unanimously.*

Dr. BETHUNE: I should like to ask if it would be practicable to have some Legislative enactment to compel seedsmen to fumigate their peas. I do not think there would be the slightest use to pass an Act of the Legislature with regard to the general public, but we might get at a large proportion of the seed peas by rendering it compulsory on the part of the seedsmen to fumigate them. I know that not many years ago, in the neighborhood of Port Hope and Cobourg, and all through Prince Edward County, where all kinds of fancy peas were grown by the acre, that every seedsman had his "bug house" and fumigated all the seed, but it seems that some have discontinued that laudable practice. I was intending, before this resolution was read, to suggest that the Ontario Department of Agriculture might issue a mandate to those who attend Farmers' Institutes to make this a point of their proceedings during the coming winter, and if that were done, then if not only the Agricultural press, but the press generally, would take up this subject, and bring home to the whole country the seriousness of it, and the ease with which it really might be dealt, and if in addition to that some experiment were made upon the line Professor Lochhead has mentioned of object lessons, I believe it would have good results.

I remember when not many years ago it was impossible to get good butter in this country in the winter time. When we got butter made from our own cows in the summer time it was all right, but you could not buy butter fit to eat in the winter. That has all been remedied by this object lesson system, the travelling dairies showing the farmers' wives how to make good butter. It has been a great success, and now we can always get good butter, and if that experiment succeeded so well, I think it would be quite worth while to adopt a similar system to teach the farmers how to deal with this terribly destructive pest.

The other day I happened to notice in the market reports from the port of Montreal that the shipment of peas from Montreal up to the first of October last year amounted to 458,000 bushels. This year up to the same date it amounted to 269,000 bushels showing a decrease in one single year in that port, up to the first of October, of 189,000 bushels. This shows what the weevil has done in reducing our exports from one port alone.

I wish to ask Dr. Fletcher if there is any connection between the mildewing of peas and the Pea-Weevil. I mean in this way; is it the case that if the pea plant is not healthy and strong and vigorous, it is far more subject to mildew than it would be if the nourishment of the plant had not been taken by the Pea-Weevil? Would it be more subject to mildew than one grown from perfect seed?

Dr. FLETCHER: I do not know from actual observation that that is the case but I can quite understand that the weakened plant would be more likely to be affected. Weevily seeds grow a weak plant which matures later and that would make it more liable to mildew.

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Some of the seed merchants fumigate 2,000 bushels at a time by having a properly constructed building and by putting 20 pounds of bi-sulphide of carbon at the top and allowing it to vaporise, which is easily done. The peas can be left in the sack. A farmer with an ordinary coal oil barrel can put 5 bushels of peas in it and fumigate them by using three ounces of bi-sulphide of carbon, which would probably cost 15 cents.

At the present time there are very few seed peas imported into Canada ; because our peas are freer from the weevil than they are to the south of us, but directly we put any sort of pressure on our seedsmen, then the peas will be brought in from the other side.

First of all we want to make it known as widely as we can that it is a serious injury, and then that there is a simple practical remedy, if they will apply it.

Prof. LOCHHEAD : If you compel the seedsmen to fumigate their seeds it will not cover the point, because there is a large amount of seed exchanged among the farmers themselves. The Minister of Agriculture is thoroughly in earnest in this matter. I received a letter from him early in the season, and he wished me to go about it in some way and do something, and of course he will provide the funds. The Minister of Agriculture is a thorough believer in fumigation himself, and he fumigates all his own peas, yet they have weevily peas in his district because the other farmers do not fumigate.

Mr. SMITH : I think Prof. Lochhead has got the correct idea with regard to this particular matter. Some years ago there was established in Guelph what is known as the winter fair. They established a "block test," that is, they show the animal on the hoof first, and then the animal is slaughtered, and they make another test ; that is one of the best object lessons we have in the country, and as a result of that object lesson the Wm. Davies Company of Toronto say, that in one year the quality of the bacon of this country improved 50 per cent. That was wholly the result of that object lesson, and the work done by Farmers' Institutes. If you can get the Institute men to take up the weevil, I am satisfied, you will influence public opinion in this country, and you can then enforce any measure with regard to the weevil. I have gone over the province pretty generally and I find that the evil is steadily extending north. At one time it did not go further than Lake Simcoe ; but last summer and the summer before, I found it up on the shores of the Georgian Bay and it was becoming quite as prevalent as in the frontier counties.

THE PEA WEEVIL.

BY W. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

Although the Pea Weevil (see Fig. 1, p. 4) has been known as an enemy of the cultivated pea for over 150 years in America, it is not a native. It probably came from the East, whence came so many of our cultivated plants, and their insect enemies as well. Peter Kalm, the eminent Naturalist of the last century, states that in 1748 pea-growing had been abandoned in parts of Pennsylvania, New Jersey, and New York, on account of the pea weevil.

It is apparent that the pea-growing industry in Ontario is doomed unless radical measures are adopted (by the farmers themselves) for the control of the weevil. The pest has made its appearance in nearly every county in the western half of the Province, and in the Lake Ontario counties as far east as Frontenac. The more eastern counties and those further north are not much troubled with the "bug." Durham, Northumberland and Prince Edward used to be the favorite section for growing peas for French and American seedsmen, but the depredations in

NOTE.—The above paper by Prof. Lochhead was not read in connection with this discussion, but is placed here as a matter of convenience.

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these counties have been so great that the growing of peas has been largely reduced during the past two or three years. Amherst Island, which was formerly a great pea-growing district, has scarcely a farmer this year who is growing peas. Throughout Wentworth, Wellington, Waterloo and Oxford the growing of the common cultivated pea has been abandoned, and the grass pea has been substituted to some extent. This latter variety does not suffer from the weevil, but it was attacked this past summer in the counties of Halton and Wentworth by a green louse, the exact nature of which I have not yet determined.

This summer I had the pleasure of visiting the Manitoulins and St. Joseph Island. There the pea-bug or weevil is unknown. Further west, around Fort William and Port Arthur, it is also unknown, and it is the duty of the farmers of these districts to initiate strict measures to prevent the importation of the weevil.

To give an idea of the diminution in the growing of peas during the last 10 years, it may be stated that in 1891 the yield of peas in Ontario was about 18½ million bushels. In 1902 the yield was nearly 11½ million—a decrease of over 7 million bushels in 11 years. The decrease would have been still greater if it had not been for the introduction of the grass pea variety.

The question of treatment is a very important one, and is not a difficult one to put into practice. Unlike many other pests, the pea weevil confines its attention to the cultivated and garden pea almost entirely. It attacks no wild varieties, hence there is no danger from re-infestation through those sources. The usual method of treatment is that of fumigation with carbon bisulphide. For several years the pea-growers of Prince Edward and other Lake Ontario counties practiced this method, but there was no wide-spread co-operation in this line of treatment among the farmers. The result was that the weevil thrived in spite of the efforts of many of the largest pea-growers.

The weevil is capable of flight, and it is possible that it may fly comparatively long distances. The first essential in a plan of campaign against the pea weevil is co-operation in the treatment of infested seed, and, without this, the campaign would be useless.

The method of treatment which has been recommended is to fumigate the seed peas in air-tight barrels or bins immediately after threshing. It is usual to use a pound or a pound and a half of carbon bisulphide for every 100 bushels of peas. For smaller amounts, the quantity is proportionately slightly increased. The peas are subjected to this treatment for 48 hours.

The question naturally arises: What is the best time for the treatment of the peas? To answer this question, a study of the development of the grub is necessary to ascertain at what stage the grub ceases eating the pea. Mr. Elmer Lick, of Oshawa, who is a careful, accurate observer, found that in every infested pod he examined that not more than one-half the damage to the pea was done until after the crop was ready to harvest. In many cases he found not more than one-third the damage which the weevil would do before reaching maturity. This was true of both late and early varieties, which were growing side by side. He found, however, that a larger percentage of the early crop were "buggy." Mr. Lick naturally comes to the conclusion that it is highly advisable to treat the peas immediately after harvest, and not to wait until the grub has become full grown.

Mr. Lick's conclusions regarding the treatment of peas are as follows:—

1. Do not sow buggy peas without treating the weevil.

2. Harvest the crop as soon as ripe, and thresh at once.

3. For seed peas, treat at once; but if for feed close up the concave of the machine tight; use full speed, and thus crack the peas and kill every weevil; or, if it is not desired to cut up the straw, run the peas, after threshing, through a crusher. (Mr. Lick would not care to risk grinding fine, for fear of heating).

"You must quit growing peas, unless there is co-operation in some way."

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Mr. Lick thinks a great deal of coal-oil as a treatment. He uses about one gallon to 10 or 15 bushels of peas. The oil is applied in such a way that the peas are thoroughly covered.

In 1897, Prof. Zavitz, of the Experimental Department of the Ontario Agricultural College, made some interesting experiments to find the value of peas for seed which had been injured by the weevil. He found that in the case of a large variety of pea, like the Marrowfat, about three-fifths of the peas which had been injured by the weevil did not germinate. In the case of a small variety of pea, such as the Golden Vine, he found that only thirteen per cent of the peas which contained the weevil grew. Thus he says,—"If a person were sowing weevilly seed of the golden vine variety, it would be necessary to sow 15 acres of peas in order to get as many plants as would be produced from sowing 2 acres of sound seed."

There is one interesting fact which I observed while in St. Joseph Island, which was that, although weevilly peas are sown, the weevils never make their appearance on the new crop. Whether this peculiarity will hold out many years, it is impossible to say, but such is the case at present.

The life-history of the pea-weevil is as follows: The weevils deposit their eggs singly on the outside of the newly formed pods, and when the peas are in blossom. The grub, as soon as it is hatched, bores through the wall of the pod and enters the pea. Within it, it eats and grows. When full grown, it is about one-fourth of an inch long, and about one-eighth of an inch in thickness. It has three pairs of minute legs, but otherwise it is decidedly maggot-like. Its body is wrinkled, and is beset with a few long hairs. In its pupal state, it rests for a few weeks in a round burrow, which is closed externally by the unbroken membrane of the pea. The winter is passed in the adult state, either within or without the pea, but usually within.

I venture to outline a plan of an experimental campaign against the weevil, and I would like the members present to discuss it as to its feasibility and probable value. The plan i based on the idea that if the entire pea-crop of a section is threshed and treated with carbon bisulphide immediately after it is harvested, the weevils in that section will be practically exterminated. I suggest, therefore, that a corps of men be appointed to treat the peas that are grown on every farm in a group of two or three townships. The pea-growers should be asked to assist in the work by providing the necessary barrels or tight bins for proper fumigation. To each member of the corps, there could be allotted all the farms on one or two concessions. Every farm would then be visited, and the peas fumigated properly. It might be necessary in some instances to fumigate the peas twice if there was any doubt as to the thoroughness of the first treatment.

The same plan could be followed out the second season. If the weevils are still abundant the third season, the treatment would be considered a failure, providing no weevilly peas had been introduced during the period of experimentation.

REPORT ON INJURIOUS INSECTS IN 1902.

DIVISION NO. 4.—NIAGARA DISTRICT.—BY GEO. E. FISHER.

Not being schooled in the science of entomology you will readily understand that I naturally shrink from accepting office in this society and reporting from the standpoint of an entomologist. My indebtedness to entomologists for assistance in prosecuting the San José scale investigation, a desire to reciprocate, and being assured by Prof. Webster and particularly by Dr. Fletcher that they themselves are only students and that I am abundantly qualified to act in this capacity, are my apology for attempting to do so.

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The opinion seems to prevail that in continually moving about the country in my official capacity I enjoy exceptional opportunities for observation and should know a great deal. While it may not seem altogether unfair to expect considerable of me in this way, the particular work in which I am engaged has so continually demanded my full time that the opportunity for thorough and careful investigation outside of matters pertaining to the San José scale is not nearly so satisfactory as when at home I went leisurely about my own orchards and, with necessary appliances always at hand, worked out such questions.

My practice has been not to accept any statement I could not verify in the field and in my judgment he who demonstrates beyond question one subject in a whole season has accomplished much more than another who has given but superficial attention to a greater number.

Notwithstanding the almost entire absence of such weather as makes ideal conditions for insects, in many instances they were present in usual quantity. The cabbage worm, striped cucumber beetle and squash bug, asparagus and potato beetles are spoken of by gardeners as having been troublesome. The potato beetle made a record, for when the vines succumbed to blight, in their efforts for self preservation the beetles attacked almost everything else, tomatoes and particularly egg plants were protected with the greatest difficulty. There were instances of tomato plants being eaten off in large quantity, by potato bugs which attacked them below the surface of the ground, before the potatoes were up in the spring. The asparagus beetle is spread over the whole of the Niagara District, and where left to itself seriously injures the crop. There are several methods of controlling it, and those which are perhaps the most successful and most generally adopted are very simple. The insect prefers the more spindling shoots which are allowed to stand and are destroyed as soon as they become considerably infested. Little chicks catch and eat the beetles, and if moved about in portable coops a single brood will protect an area of quite large extent, when cutting is discontinued the plantations are sprayed with paris green or arsenic. A gentleman at Queenston suggests a solution of saltpetre, one pound in ten gallons of water, for the suppression of cucumber and squash beetles. Others are using whale oil soap one pound in four gallons and find that it is safe for very tender plants and besides relieving the vines of insect pests so invigorates their growth that its use is economical for this purpose alone.

Canker-Worm.

Canker-worm (Fig. 2) was not so generally plentiful this season as last, but was still numerous in certain sections, where orchards were stripped as usual. Little rain fell during the larval period, which afforded a much better opportunity for spraying this year than last, when the almost continuous rain washed off the poison as fast as it was put on. In 1901, so unsatisfactory were the results from trying to kill Canker-worm by spraying, that in the fall a few growers resorted to the sticky bandage process. Even with the weather conditions favorable, spraying a large number of trees is a heavy undertaking, but those of 1901 showed that Canker-worm cannot always be controlled by spraying, though the pumps be kept going and the best of material used. In my own orchards, we had not been successful in the spring, and in the fall made an experiment of sufficient extent to fully test this method. Beginning Nov. 1st, 2,000 apple and 6,000 plum and cherry, all bearing and mostly full-grown trees, were treated. Pear and peach were not attacked, though a few years ago a neighbor had serious trouble from Canker-worm in his pear orchard. At the above date, the weather being rather cold, pure castor oil and a good quality of resin were used in the pro-

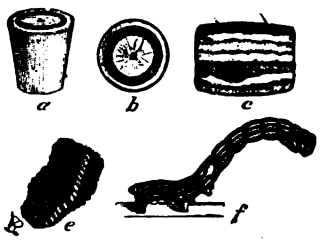


Fig. 2. Fall Canker-worm. *a* and *b*, eggs seen sideways and from above; *c*, markings on segment of caterpillar; *e*, mass of eggs: *f*, caterpillar.

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portion of equal parts by weight; in warmer weather five parts of resin to three of oil would be required. A space of six inches or more at a convenient height was scraped on rough-barked apples and the surface made as smooth as possible. The mixture while warm was applied to the bark with a brush, a strip around the tree two inches wide, which spread to four. The heavy bark of the apples soon absorbed this first application, which was promptly renewed. In the course of the season it was found necessary to treat the apples three times and the plums twice. A few moths were moving when the treating was commenced, and some of these no doubt had already reached the branches. As the season advanced and thousands upon thousands of the sluggish egg-laden moths became entangled in the wax, the situation was extremely interesting. On one small plum one hundred and fifty moths were counted, and on some of the larger apples the number of moths captured, both male and female, was too many to count. (Fig. 3.) During the spring a very close watch was kept, and as there was no movement, I have concluded that the infestation was wholly of the fall variety. As the males were made prisoners if their wings but touched the wax, there was little and probably no copulation, and Dr. Fletcher has explained that the eggs are likely to be fertilized only in passing the ovary. However this may be, so far as we could observe no eggs hatched, but remained in the body of the parent still held fast by the wax. Some who used this method collected and burned the dead females, but in our case there seemed no necessity. My interest in this matter intensified as the season for spraying came and went with this innumerable host of closely-held captives on the trunks of the trees and no larvæ in the top to spray. The men say there were not as many worms in the entire orchard this year as were on some individual trees last year. This way of treating Canker-worm is not new, but is certainly not generally understood. Mr. O. T. Springer, of Burlington, who has practised this method successfully for years, assisted me with valuable suggestions.



Fig. 3. Fall Canker-worm. *a*, male moth; *b*, female moth.

Pear Psylla.

Early in September my attention was called to an attack of Pear Psylla in an orchard belonging to Mr. Joseph Tweddle, of Fruitland. A block of 125 eight or ten-year-old pear trees was involved. The varieties affected are those in common cultivation, the Bartletts suffering most. Nearly the whole of the block was swarming with wasps, attracted by honey-dew that was dripping from the foliage. The wood was covered with a black fungus which had developed in honey-dew exuded by nymphs attacking the wood.

At the time of my first visit the foliage was largely deserted and the nymphs were concentrated on the wood, particularly the young growth, and the energy of the trees was apparently so reduced as to seriously affect next season's crop, no matter what treatment is given. Some years ago Mr. Freeman, of Freeman, lost an orchard of nearly four hundred large dwarf Duchess from Psylla. He tried to destroy the insects with kerosene emulsion, but used it of too little strength, which had no effect whatever. At home we always have some Psylla, but it is never there in sufficient quantity to necessitate treatment.

In the worst affected portions of Mr. Tweddle's orchard the foliage was so reduced as to make treatment easy, and I advised an application of crude petroleum emulsion, 1 in 10, which would kill nearly all of the nymphs and stop the drain on the trees. We subsequently treated a couple of the trees with the emulsion ourselves, and the effect was even better than I anticipated. This, followed by a thorough treatment with lime and sulphur in winter, will subdue the pest. As the eggs are deposited very early in spring, the winter treatment should not be delayed too long.

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White Rose-scale.

This insect has taken to our Raspberry plantations and seems to be widely spread. In fields situated east of Grimsby, it was found in good form both at the beginning and end of April. On the 10th of May it was rapidly increasing in size and by the 20th nearing maturity, but down to this date no eggs had been observed. On May 31st eggs were plentiful and on June 7th were found to be hatching; on the 23rd June eggs were still plentiful, hatching and larvæ fixing on the old canes; at this date the scales were present in all stages of development. These fields were not seen again till September 22nd when eggs were more plentiful than at any previous examination, lice running and fixing on both old and new wood and there were growing scales in all stages particularly on the old canes. The same conditions prevailed on the 25th of October except that the new canes were then heavily infested.

It appears from these investigations that while this scale resembles scurfy barklouse in appearance it differs from it in being multibrooded and in passing the winter alive. I intend making a careful search for eggs at the end of the season to determine whether or not there are eggs in good condition at that time, as the opinion is held that some of the eggs winter over. On September 22nd there were very few scales on the young wood in comparison with the old and not many of these were of advanced growth. If the old canes be removed and destroyed immediately after fruiting much of the spreading will be prevented as it is no doubt later in the season, when larvæ are more plentiful, that most spreading occurs. This precaution followed by a thorough treatment before growth starts in the spring with a suitable wash such as soap, crude oil or lime and sulphur will in my judgment meet the difficulty.

San Jose Scale (Figs. 4 and 5).

Owing to the cold late spring the larvæ of the San José scale did not appear till a week or ten days after the usual time, but notwithstanding this and the unfavorable weather which

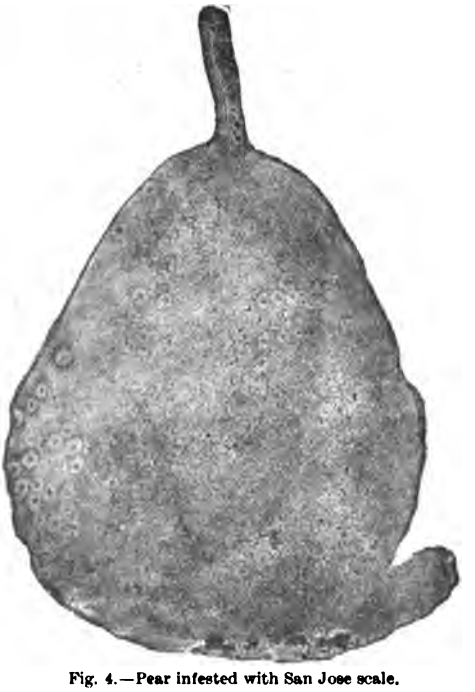


Fig. 4.—Pear infested with San Jose scale.



Fig. 5.—Portion of a branch infested with the San Jose scale.

followed, reproduction was rapid and the pest was discovered in many orchards where it had not previously been found. In many instances trees that were but slightly infested in the spring are encrusted now and likely to be ruined before the end of the season.

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Formerly the practice was to mark for special winter treatment any trees that were badly attacked in summer, but this was not satisfactory as such trees frequently became much weakened and sometimes died before the winter's frosts closed the scale's season.

Recognizing the necessity for prompt summer treatment in such cases much pains was taken to procure an effectual remedy suitable for summer use which would destroy the scale without injuriously affecting the trees. In a long series of experiments emulsions made from kerosene and crude petroleum proved the most satisfactory and are really very useful. The varying results so commonly reported from the use of kerosene are largely due to differences in preparing the emulsions and of the condition of the weather when the applications were made. They should be applied only on warm, dry, bright, airy days, and it would appear that the hotter and dryer the weather is the better will be the result in killing the scale and the safer to the trees. Spraying done on trees in leaf is necessarily imperfect for the foliage prevents the spray reaching every part of the wood, particularly the twigs. For spraying infested trees in leaf we prefer a rather coarse nozzle which sends its spray through the foliage to the wood much better than a fine nozzle. The oils resist re-attack so well that even if there be considerable breeding after the treatment is given it will not matter, for the majority of the young scales which fix will die and the tree will not be badly affected again during the season. Either kerosene or crude petroleum may be satisfactorily applied with a combination pump and diluted with water to almost any per-centage, but to use them with an ordinary pump it is necessary to make an emulsion. Kerosene emulsion 1 in 6 is a suitable strength for hardy foliage and 1 in 7 for peach and other tender foliage. That is one gallon of kerosene in a total quantity of seven gallons of emulsion. Crude oil emulsion 1 in 10 is a suitable strength for hardy foliage. This gives one quarter of a pound of soap to the gallon of emulsion and ten per cent. of oil which is all most foliage will resist. Kerosene is preferable for peach trees. I would spray only badly affected trees in summer and follow this with a thorough spraying of the entire orchard with lime and sulphur in the winter or spring.

Our experiments clearly demonstrate that lime and sulphur is altogether the most effective remedy we now have. It is also the cheapest and the safest. It is easily applied and we hope by utilizing steam from ordinary threshing engines for cooking to make it more easily procured than any other spray. A larger proportion of lime and sulphur than is necessary in California is recommended for our climate. One pound of lime and one-half pound of sulphur to the gallon of wash giving the best satisfaction in our experiments. We found no advantage from the addition of salt, in fact the best results were obtained where no salt was used, and as it seriously corroded the pump we do not recommend it.

It will be interesting to this meeting to know how this remedy appears to work out, and as frequent examinations were carefully made, I may speak with considerable confidence. There were so many living, healthy, developing females remaining that in the early examinations we pronounced the treatment a failure. When the breeding season came we were greatly surprised at finding no larvæ on treated trees and the little yellow lice simply swarming on trees that were not treated. The microscope showed the mature females on untreated trees to be packed with young, while the large, fresh, oily females on treated trees were empty, barren and entirely without any appearance of young about them. The proportion of males in the over-wintered brood is largely in excess of the females and this is nature's provision for complete fertilization in the spring which no doubt is indispensable. The males being on the surface and exposed perished from the treatment, and many of the females protected under layers of encrusted scales escaped, but as there was no copulation there was no breeding.

A most gratifying feature of our work is that it shows clearly that the scale may be easily controlled and the vigor of an orchard maintained independent of surroundings. An orchard exposed to reinfestation is of course at a disadvantage, but even this will not prevent holding the scale well in check if regular annual treatments are given.

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And now that these results are secured, fruit growers and particularly those in infested sections, will appreciate the Minister's persistent effort in their behalf, and we trust such thorough use of the remedies will be made as will speedily bring the pest well under control.

Dr. FLETCHER : Said that he was glad to be able to confirm the results obtained by Mr. Fisher in the case of the San José scale.

He had just been through the scene of these experiments with Mr. Fisher and Mr. Gibson, and saw these very trees that were treated with lime and sulphur, and they were just as healthy as trees need to be. The scale was very abundant at the beginning of the season, but now there are only a very small number of living scales there, which shows that this remedy is very effective. The treatment does not cost more than it is worth, and the application of it is useful in more ways than one, because it destroys many other injurious insects, and we have in it a remedy which comes next to the Bordeaux mixture. Lime, sulphur and salt is one of the very best fungicides we know of and when we find that it is one of the best and cheapest applications for destroying the San José scale, and at the same time will remove many other diseases that affect the tree, we should appreciate the efforts of the men who have given us this remedy.

Until the San José scale was introduced into Ontario, our greatest loss was from the brown rot of the plum, and the black spot of the apple. Mr. Evans has a specimen that he is going to show to the meeting, which will illustrate how reports come back from European markets of the fruit we ship. The farmers ship them in comparatively good condition, they only see a small amount of spot upon the apple. This sample will show you what condition these apples are in when they reach the European markets. What does this mean, it means that the fruit growers have not taken the proper care to properly treat their trees ; these apples were shipped in comparatively proper condition ; but the shipment was delayed for three weeks and this is the condition in which the apples were found. [Apples were exhibited which were so spotted and pitted with rot as to be absolutely unmarketable, and yet they were shipped three weeks before in an apparently sound condition.]

Prof. LOCHHEAD : I can assure you there is no person more pleased than I am, at the favourable results of Mr. Fisher's experiments.

Any person who has had anything to do with the San José scale knows the destruction it creates. The question is often put to the Entomologist, what are you here for if you can't get rid of the scale ?

Mr. Fisher was with me at the Pittsburg meeting of Economic Entomologists and I can assure the members here, that we are ahead of the United States as far as the treatment of San José scale is concerned. Although they reported the results of the lime and sulphur treatment, there was a good deal of divergence of opinion at that meeting.

Mr. FISHER : There seems to be some difficulty in cooking this mixture properly. The lime and sulphur preparation requires a great deal of cooking. Two hours are absolutely necessary and three hours are better than two. I am not a chemist and I cannot explain the trouble from a scientific stand point. Our practice has been to put a quantity of water in a kettle and bring it to a boil, we then put the lime into the boiling water, and as soon as we got it slaked, we threw in the sulphur. The slaking of the lime seems to have a good effect in reducing the sulphur. This is cooked for two hours. When the sulphur is first introduced into the lime, the mixture is of a light silvery color and it remains about the same color during the first hour and a half, then it begins to shade away to a dark deep amber, and some that we cooked longer became a greenish color and had quite a green cast. If the mixture is properly made you cannot wash it off the trees, nor can you wash it off your hands, if you get any on.

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When it becomes cold the lime and sulphur appear to crystallize and we have water and crystals, but we cannot stir it up neither can we restore it to life by cooking, and it will not stick when we put it on the trees. The preparation must therefore be applied while hot.

The CHAIRMAN: After it is in condition to apply to the trees, how long before it crystallizes?

Mr. FISHER: As soon as it gets cold; it would probably take half a day to cool. There is no trouble in getting it on after it is prepared, if you are not interrupted.

Mr. W. E. SAUNDERS: As regards the chemical nature of this compound, it might be of interest to state that when the lime and sulphur are combined together, they make sulphide of calcium, and sulphide of calcium freshly made is soluble. It has been in use in the drug business for a long time as a remedy for skin diseases, and I have found that in the strength which we make it, which results in a bright brick-red solution, it does not crystallize. I should think that the crystals occur from making the solution too dense. We have a solution in stock now, that has been made for perhaps three months or six months and it is still of a deep orange-red color; it contains sulphide of calcium and probably some sulphur. This solution we have bottled up and it is in good condition to-day. When it is exposed to the air it forms upon the surface a flake of a mixture of sulphur and sulphide of calcium. Decomposition, no doubt, will go on to a more rapid extent as it is exposed longer to the air. I should think that by putting this material in barrels, filling them right to the top, and putting the plug in the bung, it could be kept for weeks. If you have more sulphur than the solution can take up, it might possibly take it up while hot and throw it down when cold. If it had an excess of either one it might leave the residue in the bottom.

Mr. FISHER: We have very little sediment; the mixture appears to be perfect. We did have a lighter wash, but it left the sulphur exposed, so that it would be blown away by the wind or washed off by the rain, whereas by using a pound of lime and half a pound of sulphur to the gallon of wash, it left the sulphur covered. The sulphur seems to be deposited between the lime and the bark of the tree.

Prof. LOCHHEAD: I had a talk with a chemist at the Pittsburg meeting and he stated that when you boil sulphur and lime together, you get various kinds of sulphide of calcium There are sulphides of a high and a low degree, and these differ very remarkably.

Prof. JAMES: This is one of those things where the practice is of far greater value than the theory. We all know that the various forms sulphur assumes depend entirely upon the temperature to which it is heated. The use of the lime and sulphur mixture for the treatment of the San José scale in the eastern part of California has presented a very interesting feature to me. Perhaps most of you know that in the early days this favorite stand-by, or method, used in California was used here, but we were told by the American Entomologists that it was not at all applicable to the eastern part of the continent. It is quite evident now that our American friends came to a conclusion too rapidly, because when Mr. Fisher's department used that treatment he wrote to a large number of the Entomologists on the other side, and in their replies they admitted that their previous conclusions were hardly correct. Mr. Fisher has practically shown them the way in this matter, and I think we can safely say that his experiments are in advance of anything that has been previously done in the Eastern States, or the Eastern half of the Continent. The only way in which they can be said to have gone beyond us is in the very important work done at the Department of Washington, in sending to China and Japan for the natural parasites of the insect. It seems that after trying many experiments, we have got out into the light and are now where we have some safe and sure footing with regard to this insect.

Dr. FLETCHER: With regard to what Prof. Lochhead has said, that this work was shown to be of great importance at the Pittsburg convention, the suggestion has been made that our

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work was as good as any in the United States. We can say that it is better than anything that has been done hitherto, and more than that, it is far more extensive than anything that has ever been done in the United States During the last four years Mr. Fisher has been working continuously throughout the summer. The best work done in the United States has been done by an Entomologist who has a class to teach and other work to do, whereas, Mr. Fisher has given his whole attention to the work and we have these good results.

If a thing is worth doing and it will pay to do it, our farmers will do it. Seventeen years ago there was not a spraying machine in Canada, and now there are more than a million, because the people have been shown that it pays to use them. And so it will be with the treatment for the San José scale.

Dr. Fletcher then moved, seconded by Dr. Bethune, "that the Entomological Society of Ontario have watched carefully the efforts of the Hon. the Minister of Agriculture and his Officers to discover a practical remedy for the San José scale ever since its first appearance in Canada, and the Society now feel that they can justly, and they do hereby, tender their congratulations to the Minister for the excellent results which have been obtained through the discovery of a practical remedy for this most destructive insect."—*Carried unanimously.*

The CHAIRMAN: It is very great gratification I am sure to us all that a member of our Society, and one of its Directors should have accomplished the very good work that he has done; we also feel that an immense deal of credit is due to the Minister of Agriculture for the thorough way in which he has caused these investigations and experiments to be conducted in the face of a great deal of opposition. We feel grateful to him for what he has done, and also to his officers for their excellent work.

EVENING MEETING.

A public meeting of the Society, to which the members of the London Horticultural Society were specially invited, was held on Wednesday evening, October 29th, in a lecture room of the Normal School, by kind permission of Principal Merchant. At 8 o'clock the meeting was called to order by the President, the Rev. Dr. Fyles, who said:

Ladies and gentlemen we are happy to meet you again to talk of the beautiful objects in which the Society is interested, and to tell you of some facts concerning them. I beg to request Prof. James to take the chair this evening.

Prof. James: Mr. President, ladies and gentlemen, I accept very readily and very willingly the invitation of the Entomological Society to occupy the chair on this occasion; partly because of the high appreciation I hold of their work, and partly also because we of the Department of Agriculture who are more intimately related to that work, get from them so much assistance in connection with our own work. We have been holding a session this afternoon, and have been discussing two questions in particular. They are of very great moment to the people of this Province. We have been discussing very small things indeed. Things so small that in order to be detected, in some cases at least, they must be put under a powerful microscope. These small things mean a great deal in connection with the development of this country; they are the Scale insect that affects our fruit trees and the Weevil that destroys our pea crop. If the Society had done nothing else in connection with their meeting, but to prepare for publication the information that will be collected, then they will not have met in vain.

It is not many years since Entomology was looked down upon. It is only within the last few years that it has received that attention which it deserves, and I am afraid that even yet Entomology in most of its departments is not receiving the recognition it fully deserves. We

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are finding more and more enemies to our crops, and as they come before us we turn to the specialists, those who have made a special study of Entomology, and apply to them for help and assistance, and as these men put into practice the results of their investigations, the people as a whole are coming to the conclusion that after all these men are not merely men of theories but are men of practice, and I think we shall find in connection with this Entomological Society that theory and practice are working hand in hand as effectively as in connection with any other society organized for the general welfare of this Province.

Entomology is a subject which is not only of very great consequence to me, as these two crops I have mentioned will give evidence, but it is a subject of very great interest. It came out in discussion this afternoon that the pea crop of this Province during this past year was worth from four to seven million dollars less than it was about ten years ago. This falling off in production is to be attributed to the destructive work of a minute insect. If our entomologists can give us a simple remedy whereby the ravages of this insect can be overcome, you can understand how very practical their work must be.

We have not a very long programme to lay before you this evening, but I think that you will find that what we have to give you will be full of interest.

I have now very much pleasure in introducing to you the Rev. Dr. Fyles of Quebec.

Dr. Fyles then read his presidential address and illustrated it with a series of beautitul diagrams, the work of his own hand.

INSECT LIFE.

By Rev. Thomas W. Fyles, D.C L., F.L.S.—President.

The old Roman poet, Lucretius, made known, in lofty strains, his ideas upon Natural Things. His poetry was better than his philosophy. He held the opinion that the soul of man was diffused in atoms throughout the body. He argued that if, on the death of the body, any of these soul atoms remained in it, the soul could not properly be accounted immortal, because it suffered diminution. But, he continued, if the soul left the body with all its parts entire, how do you account for the boneless, bloodless creatures that are found in, and upon, the carcass? He seemed to think that the soul particles could embody themselves anew in different ways. If Lucretius had been an Entomologist, and had known the life histories of the Silphidæ and Muscidæ he would not have entertained opinions so absurd.

The great question of Life baffled him, as it has baffled many a philosopher since.

The boys, at the school I attended as a child, pointed out to me a celebrated surgeon, a lecturer on Anatomy, who, they said, was endeavoring to find out the nature, and the seat, of life. We regarded him with awe; but he never made the discovery—he died, and his place knew him no more.

Distinct from the highest meaning of the word Life, the Theological meaning, which we understand in our Saviour's declaration, "They would not come unto Me that they might have life," the word is used in various senses. It is used to denote:—

I. Vitality—the power by which we live and move and have our being.

II. The period between birth and death.

III. Energy, vigour; as in, He is full of life.

IV. The condition and habits of life; as high life, low life.

V. A multitude of beings; as the city teemed with life.

VI. A life history.

There are other meanings, but these will suffice for our present purpose.

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With the term Insect Life we are very familiar. The late Prof. Riley conducted under it, as a title, a publication which is highly valued, as a very treasury of Entomological information. Let us, in our consideration of Insect Life, transfer to it the meanings above enumerated.

I. And first as to the vital power. Of this it may be said that, as in the case of man, so in that of the inferior creatures, no physiologist has ever been able to make plain to us its nature and its seat. We speak of certain organs as vital organs; and we are able to trace the respiratory, digestive, nervous, muscular and reproductive systems; but the grand power that brings all into play remains a mystery. It came from God; and, when He taketh away the breath of His creatures, they die and return again to their dust.

What is the first and ordinary indication by which we judge that an insect is alive? It is *its ability to move.*

We notice on a Basswood an appearance as of a triangle of small twigs, some brown, some green. We examine it closely and perceive that we have an object before us with a head, and a trunk, and jointed limbs. Is it alive? The creature stretches out a limb, and we know that it is alive. It is *Diapheromera femorata*, Say. Fig. 6.

Again we see on a twig a small creature that in build resembles a Guinea-fowl with head and neck extended. It is brown and hard, and might, you think, be taken for a thorn. Suddenly it springs out of sight. You might say

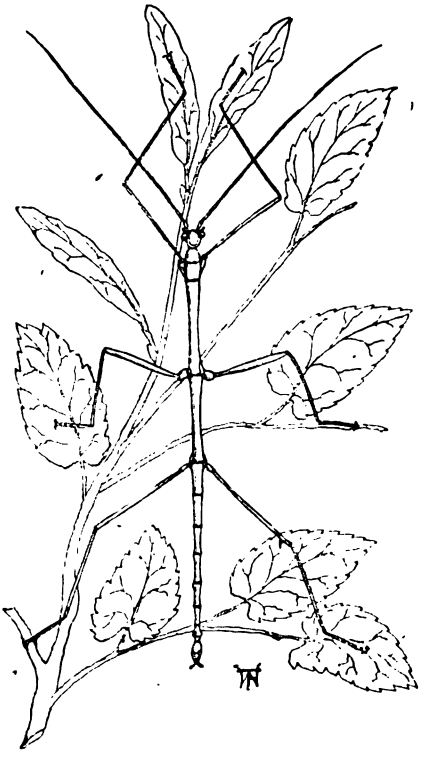


Fig. 6. Walking-stick insect (original).



Fig. 7. Leaf-hopper, much magnified (original).

of it, as old John Willett said of May-pole Hugh, "You look, and there he is: you look again, and there he isn't!"

Or again you see a piece of bark, as you suppose, projecting slightly from the boll of a tree. It is brown and ridged, and has marks as if, at some time, a small twig on either

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side had been broken off. You give it a poke, and it swerves; and some small feet are protruded; and you perceive that it is a living moth (*Calocampa curvimacula*, Morris).

And once more, you notice a seeming patch of lichen on a birch-tree. You approach to examine it; when suddenly, from beneath the deceptive fore-wings, a pair of gorgeous scarlet secondaries are displayed; and the creature flies off to a place of security. It is *Catocala parta* Guen. Fig. 8.

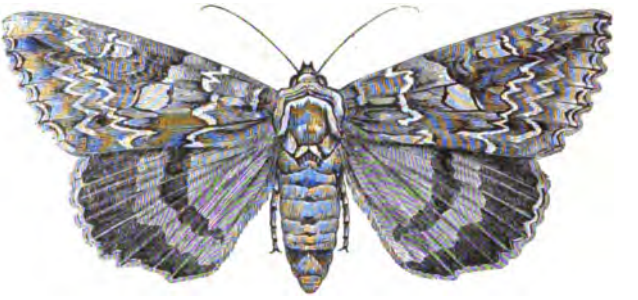


Fig. 8. Catocala parta (Red Underwing Moth).

How rapid the nervous action—how great the muscular force, that can carry the frog-hopper out of reach, that can display, and set in motion, so effectively, the ample wings of the moth!

There is a beetle (*Limulodes paradoxus*, Matth.) so small that it looks like the dot that we place over the letter *i*; yet it is gifted with nervous and muscular forces according to its need; and we can—

> —"trace in nature's most minute design
> The signature and stamp of power divine,
> Contrivance intricate, express'd with ease,
> Where unassisted sight no beauty sees,
> The shapely limb and lubricated joint,
> Within the small dimensions of a point,
> Muscle and nerve miraculously spun,
> His mighty work, who speaks and it is done,
> The invisible in things scarce seen reveal'd,
> To whom an atom is an ample field." *

In the progression of caterpillars a remarkable phenomenon may be witnessed. If a semi-translucent caterpillar be placed, when in motion, against the light—as upon a window pane—there will be observed a backward muscular action, within the body, which takes the appearance of a succession of wavelets passing from segment to segment, from the head to the farther extremity. It is owing to the nerve power passing from ganglion to ganglion and acting, in order, upon the muscles that set the legs in motion and cause the real advance — the backward flow causes the forward movement. When an Iulus is in motion, you see each pair of its numerous legs move forward in succession with the utmost regularity. (Fig 9.)



Fig. 9. Iulus multistriatus.

Respiration, and the reception, digestion and assimilation of food are as necessary to the life of the insect as they are to the life of man: and the insect is provided with organs admirably suited to carry on these functions, and with others according to its need.

II. We may call the period of the insect's existence its *Life*.

Insect life in this sense is made up of four successive stages—the *egg*, the *larval*, the *pupal* and the *imago* stages.

Some kinds of insects pass through all these rapidly, as for example, the House Fly. With it, the egg stage lasts only twenty-four hours.

* Cowper. *Retirement.*

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The following table, which I have made up from the last five completed volumes of the *Canadian Entomologist*, will give an idea of the usual length of the egg stage of insects :—

Colias interior, 6 or 7 days, Lyman, Vol. XXIX., No. 11.
Epirranthus obfirmaria, 13 days, Fyles, Vol. XXIX., No. 11.
Brephos infans, 8, 9, or 10 days, Brainerd, Vol. XXIX , No. 11.
Trigonophora periculosa, 10 days, Fyles, Vol. XXXI., No 2.
Euprepia caja, 9 days, Gibson, Vol. XXXII., No. 11
Arctia phalerata, 7 or 8 days, Gibson, Vol. XXXII., No. 12.
Xylina Bethunei, about 14 days, Lyman, Vol XXXIII., No. 1.
Phlyctænia ferrugalis, 14 days, Fletcher & Gibson, Vol. XXXIII., No 5.
Arctia virgunculu, 7 or 8 days, Gibson, Vol. XXXIII., No. 12.

The most remarkable egg period that has come under my notice is that of *Pamphila Manitoba*. The egg stage of this insect lasts for eight months. In the year 1894, on the 8th day of August, I witnessed the laying of a batch of the eggs. On the 20th day of April, in the following year, I saw the tiny larvæ bite their way to freedom from the shells in which they had lived so long. The other stages of the insect's life were completed within four months—in less than half the period of the egg stage.

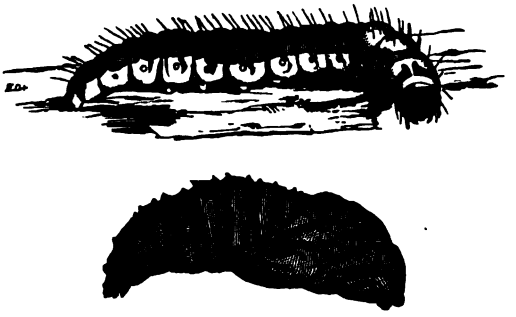


Fig. 10. Caterpillar and Chrysalis of a Cossus.

The larval period also varies in different species. It is the insect's feeding time. In the case of a Bombyx, it is the time when sufficient nutriment must eb assimilated, to sustain the insect through all its after existence. Some larvæ are quickly "full fed," and go directly after into chrysalis. Others spend the Winter in a state of torpidity, and complete their growth in the Spring. Such, for instance, are the larvæ of *Melitæa Harrisii* Scudder. These are gregarious in the Fall, and may be seen apparently tangled up in dirty-looking webs upon the heads of the White Aster. When disturbed they strike an attitude, and seem to be all legs. In the Spring they scatter, and feed up on the young shoots of the plant. The butterflies from them appear in June. Their life is completed within a twelvemonth.

But with the Cossidæ the larval stage is greatly prolonged. Packard has given illustrations of *Cossus Centerensis*, Lintner, in which the appearance of the larva is shown after a growth of four months, of a year and four months, of two years and four months, and of three years, when the caterpillar was ready to pupate. (Fig. 10.)

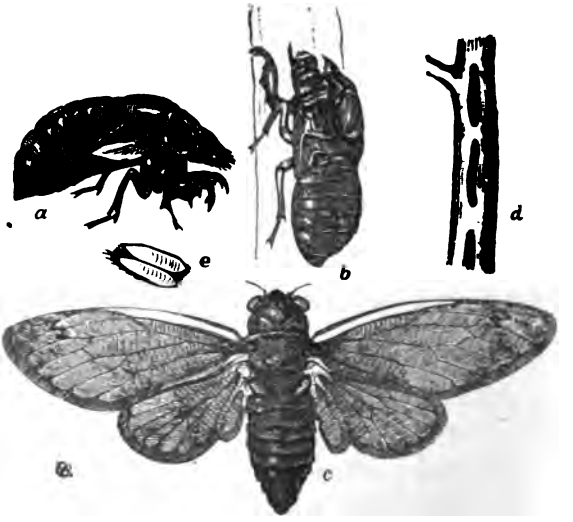


Fig. 11. Cicada septendecim. *a*, larva ; *b*, pupa case ; *c*, perfect form ; *d*, eggs deposited in a twig.

But the most extraordinary prolongation of insect life is that of *Cicada septendecim*, Linneus (Fig. 11). This creature, as its name implies, is seventeen years in attaining perfection. In length of life it stands alone amongst insects.

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III. The energy of many species of insects is surprising—they are full of life. In some cases, as in that of the mosquito, they are—as the little girl said of a troublesome puppy—"*too much alive.*"

On the 22nd of June of this year, I was staying at the beautiful country house of the Honourable Richard Turner, on the Island of Orleans. I looked from my bedroom window early in the morning—it was a bright, sunny morning—and lo, the air was full of light gauzy forms sporting around the trees on the lawn and over the tops of them. There were myriads of the creatures ; and all day long they kept up their mazy dance, seldom alighting to rest. They belonged to the species *Ephemera simulans*, Walker The wings of this species are spotted with brown, and are strengthened with an exquisite net-work of "nerves." The long waving tails of the insects add grace to their movements. (Fig. 12).

If I may, I will here mention an episode, that was narrated to me by the much esteemed Editor of our magazine, Dr. Bethune. Some years ago, an alarm of fire was raised in the town in which he then resided The fire-engines were called out and there was a great commotion From the roof of a large warehouse, near the water, volumes of

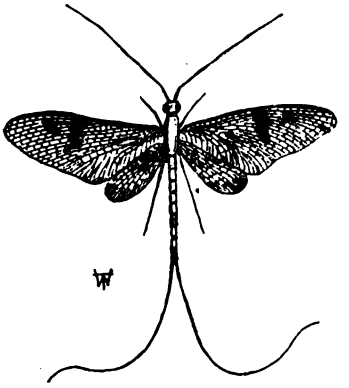
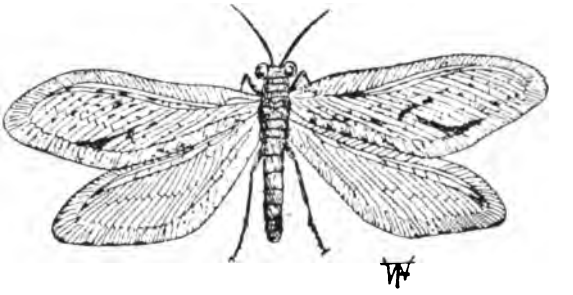


Fig. 12. (Original.)



Fig, 13. (Original.)

seeming smoke and heated air were rising and eddying. On reaching the building the firemen found that they had been misled, or, as the boys would say "sold." The appearance that had alarmed the town was caused by innumerable specimens of *Polystichotes punctatus*, Fab, rising from. and sporting over, the roof. (Fig. 13.)

Often during the time I lived in the Eastern Townships, when driving home in the calm summer evenings, I noticed above the top of some giant monarch of the forest, a mysterious moving column just discernible against the pale after glow of the sunset. The appearances were due to assemblies of insects, taking their pleasure in the heights.

Who has not noticed the dash with which the bee comes suddenly out of the blue and alights upon the foot-board of the hive, as if, like the clown in the pantomine he would say, "Here we are again !"

That energetic little fellow the Flea, *Pulex irritans*, Linneus, can leap thirty times its own height.

Who has not admired the persistence with which the bot-fly, *Gastrophilus equi*, Linneus, keeps up with the trotting horse and hovers around its legs, till opportunities occur of attaching its eggs to them.

It is the cold breath of approaching winter that robs the insect world of its energy, that takes the life out of it. Apropos of this, "The Duchess" in her story entitled "Her Last Throw" has a little piece of quiet fun. One of her characters, Fay, is speaking :—

"Her voice annoys me. It is so slow—so *drawlly*. It is irritating. It is lifeless. She talks as though she were a fly in October."

"Captain Severn laughs rather constrainedly.

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"Oh! And is it in October flies talk? says he. How interesting! After all, the one subject never *quite* mastered is natural history. It is always *full* of surprises."

If flies do not *talk*, they have some mysterious mode of communicating with their kind. One evening, when I resided in England, returning to my home I noticed a number of large handsome moths fluttering around an out-building. I looked about and saw others, coming from all quarters, and as far as the eye could see. I recognized them as males of the species *Lasiocampa quercus*. Presently it occurred to me that a female of the species might have come from a cocoon in my insect breeding cage. I opened the door of the out-building, and—in flocked the moths. So intent were they upon paying their respects to the lady moth, who was really within, that they flew into my hands as I undid the gauze covering of the cage. What called them? A voice unheard by man—a subtle effluvium—or emanations yet more strange? We know not; but they came from far and near, full of life and energy. The female chose her mate; and the rest fluttered disconsolately away, or fell inertly to the ground.

IV. The term life is applied to the habits and mode of living. We say, what a strange life to lead!

The Broad-leaved Aster (*Aster macrophyllus* L.) grows in patches of considerable size in the woods around Levis. In the month of June of this year I noticed that many of the large ground leaves of the plant were folded over, from both sides, and crinkled. On opening one of them I found that a larva had turned the leaf into a cool and pleasant tent for itself, and was feeding upon the parenchyma of the leaf.

This larva was about nine lines in length, and was of a pale green, with dorsal, sub-dorsal and side lines of darker green. The head and second segment were jet black and glossy. The fore-part of the third segment was dull brown—on the after part of it were four conspicuous white patches. At intervals, along the sub-dorsal lines, and elsewhere on the body, were round jet black dots. The spiracles were black. The under side of the larva was pale green. The claspers and anal segment were marked with black.

On June 25th the larva span a capsule-like, white cocoon, open at one end, for the exit of the moth. Its plan was to place itself on the under side of a fresh leaf, upon the midrib; then to affix its threads at a certain distance on either side of the rib, and to draw so much of the leaf as lay between, into a fold or crease. Within this it formed its cocoon.

The moths appeared on July 10th. The insect measured when displayed ten and a half lines across. Its body was four lines in length, and its antennæ three lines. The palpi were dark brown, turned back usually. The basal part of them was spindle-shaped; the terminal point was smaller, long and pointed.

The fore-wings were brown, clouded with darker brown towards the hind margin. They had a sub-terminal line of paler brown spots bordered with black. Beyond the centre of the wings was a pale brown horse-shoe like mark, not very distinct.

The secondaries were grey with a lighter well-marked sub-terminal line, and a grey fringe. The body was tufted at the extremity. The tarsi were ringed with white.

Professor Fernald tells me that the moth belongs to the genus *Trichotophe*, Clem. He does not know the species. I think it probable, therefore, that it is unnamed; and I venture to give it the provisional name of *Trichotophe Levissella*. Its life is a curious one.

I have raised from this species the parasite *Hemiteles nueronatus*, Prov.

The mode of life of a Tortoise Beetle that has lately made its appearance in the neighborhood of Quebec is a remarkable one. The larva feeds on the burdock and the thistle. It moulds its exuviæ and dejecta into a screen which it supports over its body by means of i s forked tail—thus disguising itself from its enemies, and sheltering itself from the hot sun. When it goes into pupa it cements itself to the leaf. The pupa is brown and drab, and, round

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the abdomen, is set with white branched spines. The perfect insect is a pretty pea-green, shield-shaped beetle. I have described it in the *Canadian Entomologist* for this month.

The Syrphus flies (Fig. 14) lead a remarkable life. Their larvæ come from eggs laid upon plants on which aphides abound. They are blunt at one end and tapering at the other, and they have powers of extension and retraction (Fig. 15). They drive their sharp mouth organs into the aphides and suck them dry—as a boy might suck an orange—rejecting the skins. They spend the pupal period of their existence in curious hunched-up cases. The flies are handsome. They sustain their life upon the nectar of flowers, and they may be seen upon the heads of yarrow as late as the beginning of October. There are several species of them.

One day in September I was examining the blossoms of the Turtle-head (*Chelone glabra*), and admiring the beautiful gothic arches formed by the curved stamens and the flocculent anthers. I noticed that the pistil of the blossom extended over these and was bent down in front of them so that it would come in contact with intruding insects and be charged with pollen that they conveyed. I looked round to see what insect would venture to open that Turtle-mouth and tread that arched way. A movement in one of the blossoms arrested my attention and I saw that there was an insect within. So busily engaged in the recesses of the flower was this spoiler that I was able to pluck the blossom and put it and its occupant into a box that I had ready.



Fig. 14.—Syrphus fly.



Fig. 15.—Syrphus fly larva sucking out the vital fluids of an aphis.



Fig. 16.—Lace-winged fly.



Fig. 17.—Lace-winged fly, eggs and larva.

On reaching home I found that the fly was *Syrphus Americana*, Wied. The Syrphus fly is a beneficial insect—it leads a useful life.

V. We say that the plant is teeming with life, meaning that numerous living things infest it.

At Montmorency, on the 30th of July, I noticed something peculiar in the plants of *Œnothera biennis*, L. that abound there. Instead of growing in a graceful spike, the flower-buds were crowded in a flattened mass. I plucked a number of the heads and examined them at leisure. They were alive with aphides, and preying upon these were larvæ of the Lace-wing fly (*Meleoma Slossonæ*, Banks) (Figs. 16 and 17) and larvæ of four kinds of Syrphus flies, viz., *S. arcuatus*, Fallen, *S. Americanus*, Wied., *Platychirus quadratus*, Say, and *Sphœrophoria cylindrica*, Say. I also found in them caterpillars of the noctuid *Alaria florida*, Guenèe, and of a beautiful little Tortrix that is new to me. From the aphides I obtained some minute Proctotrupids.

Another plant that abounds with insect life is the Golden Rod (*Solidago Canadensis*, L.). At the summit of the flower-head works the larva of *Pedisca Scudderana*, Clem. In the stem are found the hollow galls of *Gellechia gallo-solidaginis*, Riley, and the pithy galls of *Trypeta solidaginis*, Fitch. In the leaves are the disks caused by the fly called by Osten Sacken, *Cecidomyia carbonifera*. These three last named species are liable to the attacks of parasites. Among the blossoms of the plant lurks the Hemipteron *Phymota erosa*, Linn. awaiting its prey; and numbers of butterflies, moths, bees and flies resort to the plant—it abounds with life.

One of the most remarkable assemblies of insect life that I have witnessed was on the walls of an electric power-house at Cote St. Paul, Montreal. The building was close to the

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Lachine canal and near the aqueduct. Low down in front of the building was an arc light. Attracted by this was an innumerable company of Neuroptera. Both the variety of species and the number of each kind were surprising. It was a calm, soft evening, a very gala time for the Neuroptera. In the assembly were the beautifully striped *Macronema zebratum*, Hagen, the elegant *Setodes exquisetor*, Walker, with its golden spotted border, and the diaphanous *Chloroperla bilineata*, Say.

VI. By the word life we sometimes understand a life history.

Scattered through the pages of the *Canadian Entomologist* will be found many life-histories of various kinds of insects. They may not, by the general reader, be deemed as valuable as "Plutarch's Lives," or "Walton's Lives"; but to entomologists they are deeply interesting; and we gladly welcome every addition to their number.

Among the most wonderful of the insect life histories I have read, are those of *Hormaphis hamamelidis*, Fitch, and *Hamamelistes spinosus*, Shimer. They appear in "Technical Series, No. 9, U.S. Department of Agriculture," and are written by Mr. Pergande. The creatures whose lives are recorded are two species of plant-lice inhabiting both the witch-hazel and the birch.

Mr. Pergande tells us that,—"The study of the life history of these, after numerous failures and disappointments, *covering a space of twenty-two years of patient labour*" was at length brought to a successful conclusion. I will speak only of the first named insect.

It lays its eggs in October upon the branches and twigs of the witch-hazel. They produce stem-mothers, which in colour are of a dull black, and are set with white, iridescent waxy rods. Around each of these stem-mothers a gall is formed within which it lives. It changes its skin three times before attaining its growth. It then brings forth its progeny (numbering 100 or 120) within the gall. These are the *migrants*. They grow rapidly, changing their skins four times. At the last change they become winged. They leave the gall at the end of May and seek, and settle upon, the black birch. They are of a dark purplish colour and have colourless or slightly dusky wings.

Each migrant deposits about fifty larvæ upon the under side of the birch leaves. The larvæ change their skins three times, and then present an extraordinary appearance. They are almost round and flat, and have a fringe of cylindrical waxy rods. Their body colour is dusky brown, or black; and, in the fringe, the lowest third of each rod is white, and the other two-thirds glassy and iridescent. The insects at this stage are closely cemented to the leaf. After two generations more, and about the end of August, comes the sixth generation or *return migrants* which undergo four changes—becoming pupæ at the fourth. These pupæ produce the winged insects that return to the witch-hazel. The migration continues throughout September. From these return migrants comes a brood of wingless males and females, the latter of which deposit their eggs upon the witch-hazel twigs in October, as was at first stated.

We have dwelt upon insect life in the different meanings in which the term is used. I trust that your interest in the subject will not end with this night's proceedings. All around us, and all the time, there are natural objects and workings of nature deserving of our close attention. "For everything there is a purpose, and in everything there is a meaning, if only we have the eyes to see it, and the hearts to understand it." The Entomological Society of Ontario was intended to be, and *is*, a guide to nature studies. If any gentleman present be not a member of the Society, I invite him to join it. In entomological pursuits he will learn lessons of God's power and goodness that will strengthen his higher life; he will acquire information that will be of interest and service to him all his life long. His presence at our meetings will give new life to our proceedings. He will find new interests and pleasures that will banish *ennui* from the life he leads; and in the end, if he has proved a useful member of the Society, the editor of the day will, I doubt not, *write his life-history for the pages of the "Canadian Entomologist"!!*

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PROF. JAMES: Ladies and gentlemen, we always look for a paper of much interest from Dr. Fyles, and he has kept up the good reputation he has already achieved in this Society by his paper this evening. I have always taken a great interest in the Society and never fail to read anything the Doctor has written. I remember some years ago reading some reminiscences of the life of Philip H. Gosse, a celebrated entomologist who lived in that part of Canada from which the Doctor comes. I consider his paper on the insects of the Bible one of the most instructive papers I have ever read; and others upon the insects of Shakespeare and of our modern poets most interesting and attractive. The Doctor is always able to add a literary finish to his work on entomology. He tells us to-night in one place that natural history is full of surprises, and this reminds me of a little incident I read in a New York paper. Cooper, the novelist, in one of his stories described a young man driving along the road who came to a house, pulled up his horse, jumped down from the rig and tied his horse to a locust. The supposition is, of course, that a locust tree was meant, when, however, the French translator came to this passage he evidently was stuck by the word "locust." He turned to his dictionary and found only one meaning, and that was the locust or grasshopper (*Sauterelle*), and he makes Cooper's young man tie his horse to a grasshopper! This rather staggered the translator, and he thought it necessary to add a foot-note, which ran as follows: "In America the grasshopper grows to a very large size, so they stuff them and add a few weights to hold them down and place them in front of their houses to use them as tie-posts"! The natural history of America certainly is full of surprises.

SOME COMMON BUTTERFLIES, AND SOME NOTED BUTTERFLY HUNTERS.

BY WM. LOCHHEAD, ONTARIO AGRICULTURAL COLLEGE, GUELPH.

The younger students of insects, and those of us who are actively engaged in the warfare against injurious insects, can hardly realize the conditions under which the older entomologists worked; and I make bold to say that we will never know how much we owe to them. We are indeed fortunate in our day and generation. We have ready access to large collections correctly named and arranged through no effort of ours. We have scores of splendidly illustrated volumes, each of which can be bought for a trifle and placed on the shelves of our own library. We have numbers of specialists who can help us out of the many small difficulties which often arise. All of these privileges were denied to the workers of a generation ago, and we marvel at the amount of good work done under obstacles which would now be termed well nigh insurmountable.

It is my purpose this evening to tell you something about some of our great collectors, including some of those stout-hearted men who worked unremittingly without hope of money reward, and more than that, without the sympathetic encouragement of the people whom they were trying to help. They were looked upon as harmless "bug-hunters", and they were allowed to live, because the community believed that it took all kinds of people to make a world. But times have changed. Entomologists are now looked upon as persons who are doing a necessary and a valuable work for the country. Governments spend money on their support, College chairs are endowed that students may receive instruction in Entomology, people are beginning to clamor for a better knowledge of insect-life, and the parents of school children are demanding the introduction of Nature Study into our schools.

I wish to state at the outset that Entomology knows no national boundaries, for the entomologists of all countries form one grand brotherhood of workers. Naturally, then, I shall not confine my remarks to our Canadian band. I shall introduce to you many co workers from the United States, co-workers whom we always delight to honor, for to them we owe much.

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With the aid of the electric lantern, I hope to make quite real both the persons and the insects about which I shall speak. I regret that, through oversight on my part, lantern slides of some of our prominent collectors were not prepared.

The first face shown on the screen is one quite familiar to a London audience. The name of Dr. Bethune is well known in scientific circles throughout Canada, the United States, and Europe. He has been Editor of the "Canadian Entomologist" for upwards of 22 years, and the credit of its present high standing is due almost entirely to his brilliant work. Dr. Bethune was a contributor of valuable papers on insect-life nearly 40 years ago. He is one of the few surviving charter members of the Entomological Society which was organized in 1863. From 1865 to 1873, Dr. Bethune was Editor of the Entomological department of the Hon. Geo. Brown's "Canada Farmer", and for nearly 40 years he has contributed articles to the agricultural papers on subjects of economic importance.

The second face is also familiar to Londoners. Dr. Saunders and Dr. Bethune were a fine team of workers. He, too, is a charter member of the Entomological Society of Ontario, and until he became Director of the Dominion Experimental Farms was one of the leading authorities on Entomological subjects. His work "Insects Injurious to Fruits," published in 1883, is still the best thumbed book on the shelves of the working Economic Entomologist.

The third face is also familiar to Londoners. Mr. J. M. Denton was one of the most earnest collectors of our Society. Readers of the Annual Reports of the Entomological Society recognize how much he helped to make those Reports so valuable.

The fourth face is that of our worthy President,—Rev. Dr. Fyles of Quebec. He and Mr. Lyman of Montreal whose picture follows have done much in stirring up the enthusiasm of lovers of insects in our sister province, and both have done work of real scientific merit.

Our sixth face is that of Mr. Harrington of Ottawa, and is probably not so well known as the preceding, since his duties at Ottawa have prevented his attendance at our annual meetings for four or five years. Mr. Harrington is one of the leading authorities in America on Hymenoptera and Coleoptera. He is one of our younger men, so that much may yet be expected of him.

The seventh face is one well known from the Atlantic to the Pacific. I do not care to say much about Dr. Fletcher in his presence, suffice it to say that his heart and head are as large as his body, and that is saying a great deal. Long may he live to fill the position which he now adorns!

The last Canadian to whom I shall refer is the Abbé Provancher of Laval University, Quebec. In 1869, this indefatigable worker, without the aid of reference libraries or access to reference collections, began the "Naturaliste Canadien" and continued this magazine up to 1891, completing 20 volumes. In the meantime, in 1874, he began his "Faune Entomologique du Canada," a series of volumes devoted to descriptions of Canadian Insects. The first volume, completed in 1877, is devoted to Colooptera. In 1878-79-80, he issued supplements to this volume. In 1883, he completed a second volume which was devoted to the Orthoptera, Neuroptera and Hymenoptera; and a little later he published additions to his Hymenoptera. In 1890, he completed his third volume devoted to the Hemiptera. He died in 1892. I regret that I am unable to present a likeness of this able French Canadian Naturalist.

Now, I turn to our co-workers in the United States. The first is T. Wm. Harris, who lived from 1795 to 1856. This man was the first paid American Entomologist, and his publications date from 1823. These were followed by a long succession of interesting and original articles dealing chiefly with the injurious Insects of New England. He published a Report entitled "Insects Injurious to Vegetation" in 1841, this being known now as "A Treatise Upon Insects Injurious to Vegetation." As Dr. Howard remarks: "This book is to-day as valuable as when first written, more than 50 years ago." In the early part of his life, Harris

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worked practically alone; but, in 1854, Dr. Asa Fitch was appointed Entomologist for th State of New York. Dr. Fitch was born in 1809 and died in 1879. He published 14 reports, in all of which are observations and work of a valuable character.

The next picture is that of Townend Glover, who might be called the first entomologist of the Federal Government at Washington. His first report dates from 1854. For the 10 years between 1856 to 1866, Fitch and Glover were the only Economic Entomologists of great note in America.

The next face is that of Benj. D. Walsh, an Englishman by birth, who was a contemporary of Fitch and Glover, but began later than the previous two to write articles along economic lines. In 1868, Walsh was appointed State Entomologist for the State of Illinois. He is said to have been a very interesting speaker, and one who could hold an audience of farmers for hours at a time when he dealt with entomological subjects.

The next face is that of C. V. Riley, who also came from England,—one of the most famous economic entomologists the world has ever produced. In 1868, Riley was appointed entomologist for the State of Missouri. He published 9 annual reports covering the whole field of economic entomology. In 1878, on Glover's death, Riley was appointed entomologist of the United States Department of Agriculture. With the exception of two years, when Prof. Comstock was entomologist, Dr. Riley had charge of the Government work up to June 1894, when he was succeeded by the present entomologist, Dr. L. O. Howard.

Dr. Howard is a leader among entomologists; and, as chief of his department, has been a great success. He has the faculty of gathering around him a strong corps of assistants, and these he encourages to do much original investigation by giving them full credit for all the work they do. Dr. Howard is a prolific writer—his latest important publication being "The Insect Book," an illustrated manual of popular entomology.

Our next picture is Dr. J. B. Smith of New Jersey in his office and laboratory. He is another of our best known entomologists. In 1895, he published a college text-book called "Economic Entomology," a valuable guide to the insects which are of economic value. Dr. Smith is a specialist in the Noctuid family of moths.

The next is Dr. W. J. Holland of the Carnegie Museum, Pittsburg. His specialty is the Lepidoptera, and his most recent work is the "Butterfly Book" which should be in every school library. It is a marvel of cheapness and profusely illustrated with coloured plates.

Next comes W. H. Edwards, the great Lepidopterist. His grand work on the butterflies of North America is a monumental one, filling three large quarto volumes with exquisite coloured illustrations.

The next picture is that of Prof. Comstock of Cornell University. Although an investigator of great originality, his strongest claim on the brotherhood of entomologists is the inspiring influence which he has exerted on the many students who flock to his class-room and laboratory. I may say truly that about two-thirds of all the entomologists in America to-day have been in his laboratory and have come under his influence. His published works are known to every student. They have done much to systematize the study of insects, and to make it possible for the young collector to make headway.

Next comes one of our famous women who have popularized the study of insects. Mrs. Comstock is a meet companion and helpmate for the Professor. Besides being a student of insects, she is an illustrator of insect life and has prepared a large proportion of the illustrations in her husband's books. For the past two years, she has been devoting her attention to the extension of Nature Study in New York State.

The next woman is the late Miss Ormerod of England. She has done more than any other person in Great Britain to build up economic entomology. Her reports published a her own expense, are almost invaluable, and her Manuals are classics.

The last picture is that of Prof. Webster, whom most of our members know well. For

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many years, he attended our annual gathering, and assisted us in our discussions ; he moreover helped us when we were fighting the San José scale. Having received an appointment in Illinois, he is now unable to be with us, much to our mutual regret.

Now we come to the consideration of some of our common butterflies and moths. (Colored illustrations of the following were presented by means of the lantern) ; Papilio turnus ; Vanessa antiopa ; Pieris rapae ; Anosia archippus ; Eudamus tityrus ; Samia cecropia ; Hyperchiria io ; Phlegethontius celeus ; Everyx myron ; Deilephila lineata ; Tropæa luna ; Œdemasia concinna ; Orgyia leucostigma ; Bombyx mori ; Cutworms ; Clothes' Moths ; Hyphantria cunea ; Acronycta ; Prionoxystus robiniae ; Halisidota ; and Sannina exitiosa.

In most cases, all the four stages egg, caterpillar, pupa, and imago were shown. Such forms as Pieris, Orgyia, Bombyx, Cutworms, Clothes' Moths Hyphantria and Sannina, which are of economic importance, were dwelt upon more at length.

At the conclusion of Prof. Lochhead's lecture, Dr. Fletcher rose and said : I am sure everyone present has been much pleased with the entertainment we have had this evening ; Dr. Fyles's delightful address, full as it was of so many ideas of interest, must have pleased everybody. Prof. Lochhead's illustrations with his remarks will, I have no doubt, teach us a great deal about insects, and I have much pleasure in moving a vote of thanks to Dr. Fyles and to Prof. Lochhead.

The motion was duly seconded and carried unaminously.

Dr. Bethune : Before we separate I should very much like to propose a vote of thanks to the chairman for the very able manner in which he has presided here to-night, and for coming from Toronto to be with us, also for his interesting remarks at the beginning and at other times during the proceedings ; and I should like to add to this vote of thanks the name of Mr. Principal Merchant, who has kindly allowed us the use of this lecture room, and of Mr. Dearness for the able way in which he has taken charge of the lantern.

The motion was seconded and unaminously adopted.

Mr. Dearness made a suitable reply on behalf of himself and Mr. Merchant, and the meeting adjourned.

SECOND DAY'S SESSION.

Thursday, October 30th, 1902.

The Entomological Society resumed its meetings at 11 o'clock, a. m., the President, Rev. Dr. Fyles, occupying the chair. The Directors' Reports on the insects of the year were first called for ; at the close of the reading of each there followed a general discussion on the insects referred to and much valuable information was given. Specimens were also exhibited in illustration of the subjects treated of, many of which were presented to the Society's collections. The reports of the Council and officers for the past year were read and adopted ; the meeting then proceeded to the election of Officers, which resulted as shown on page 2. The reports of the Branches and Sections were read and approved.

In the afternoon the Society met at 2.30 o'clock and the chair was taken by Prof. Lochhead, the newly elected President. After the reading of Reports was completed, papers were read by Dr. Fletcher, Prof. Lochhead, Messrs. Moffat, Lyman, Stevenson, Norris, Gibson and others, and were in many cases fully discussed. The majority of the papers are published in the following pages, but a few, being of a technical character, are to appear in the "Canadian Entomologist," the monthly organ of the Society ; among the latter should be mentioned papers by Dr. Fletcher and his assistant Mr. Arthur Gibson on "The Life-history of the Variable Cutworm, *Mamestra Atlantica*"; by Mr. Gibson on the Canadian species of the genus *Apantesis* (*Arctia*) with special reference to the larvæ ;" and "the Life-history of *Crocigrapha Normani*."

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A large number of rare and interesting specimens were exhibited by Dr. Fletcher, Dr. Fyles, Mr. A. Gibson, Mr. C. H. Young, Mr H. H. Lyman, Prof. Lochhead, Mr. J. D Evans, Mr. G. Chagnon and Mr. A. E. Norris.

The following exhibits were made by Dr Fletcher and Mr. Arthur Gibson :

A beautiful series of *Smerinthus ophthalmicus* reared from eggs received from Mr. J. W. Cockle, of Kaslo, B. C. Most of the specimens were of a beautiful fawn colour, although the female which laid the eggs was of a slaty grey tint.

A series of *Nemeophila petrosa* from eggs collected at Banff by Dr. Fletcher, and to compare with these a series of the form known as *Nemeophila Selwynii*, Hy. Edwards, from Nepigon. Dr. Fletcher stated that although the Rocky Mountain form was extremely variable, one specimen being actually almost undistinguishable from *N. Selwynii*, the species taken at Nepigon was extremely constant in markings. Of hundreds taken during the last ten years he had never been able to catch, or rear, one which approached the western form in the amount of markings. The only difference noticeable between extreme examples of these two forms, which seems constant, is the presence, at the base of the costa of the western form, of an orange mark of varying length.

Life histories of the following species, showing larvæ in all stages, pupæ and moths :

Crocigrapha Normani, Mamestra grandis, Mamestra atlantica.

Two new strawberry pests from Vancouver Island, *Petrophora truncata* and *Scopelosoma tristigmata* were also shown in their different stages.

Hemileuca maia, var. *lucina*, from Mr. Criddle, Aweme, Man.

Coenonympha inornata taken at Ottawa this year for the first time by Mr. A. E Richard.

Erebia disa from Banff, Alta.

A series of *Erebia epipsodea* showing great variation in the undersides.

Lycæna pseudargiolus, var. *nigrescens*, a new variety from Mr. Cockle, of Kaslo, B. C.

Lycæna pseudargiolus, var, *argentata*, a new variety from Manitoba (E. F. Heath).

Plusia formosa, from Mr. W. McIntosh, St. John, N. B.

Semiophora elimata, from Mr. W. McIntosh, St. John, N. B.

Phyciodes Hanhami, a new species from Manitoba somewhat resembling *P. nycteis* on the underside.

The brown-tail Moth, (*Euproctis chrysorrhoea*) a perfect male, the first specimen recorded from Canada, which was taken by Mr. W. McIntosh, at St. John, N. B.

Chrysophanus dorcas, male and female, a species taken on the Georgian Bay, at Nepigon and at Rounthwaite, Man. which Dr. Fletcher believes to be the true *C. dorcas*, of Kirby.

A fine specimen of *Euprepia caja*, var. *Utahensis*, bred from larva received from Mr. E. P. Venables, Vernon, B. C.

Mr. Gibson in illustration of his paper on Canadian species of the genus Apantesis (Arctia) exhibited a fine series of *phalerata* and *nais*, with larvæ in different stages, as well also of specimens of *vittata*, *Anna*, *Williamsii*, with the var. *determinata*, *ornata*, with the var. *achaia*, *phyllira*, *rectilinea*, *Celia*, *figurata*, *michabo*, *Nevadensis* and *complicata*. Besides these he showed three specimens of a species which Dr. Dyar thinks may possibly be *Quenselii*, var. *turbans*, described from Mongolia, and which is new to North America. These were collected at Calgary, N. W. T. by Mr. T. N. Willing, and in a general way somewhat resemble small specimens of *virgunicula*.

Rev. Dr. Bethune exhibited the type specimen from which Dr. Saunders described *A. Celia* which is now believed to be a good species.

Votes of thanks were passed to the following :

Mr. C. H. Young, Ottawa, for a donation of specimens for the Cabinets, including inflated larvæ of 6 species of noctuid larvæ.

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Mr. A. E. Norris, Montreal, for sending for exhibition a collection of lantern slides taken by Mr. A. H. Holden and beautifully coloured by Mr. Norris, and also for sending for exhibition a collection of insects to illustrate his paper on the Insects of the year at Montreal.

Mr. G. Chagnon, Montreal, for a pair of the new species of Dipteron, *Teph onota Canadensis* lately described.

Dr. Fletcher, for a pair of *Chionobas Macounii* for the Society's Cabinet.

Mr. H. H. Lyman, Montreal, for a specimen of *Argynnis Chariclea*.

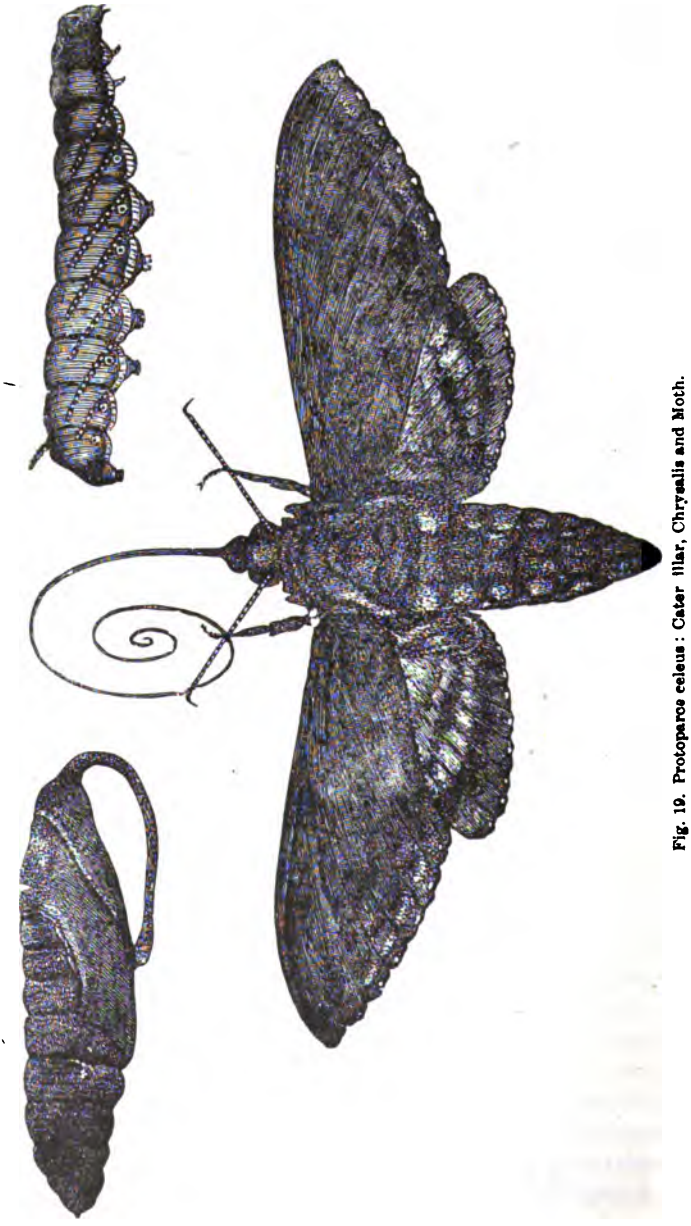


Fig. 19. Protoparce celeus : Cater pillar, Chrysalis and Moth.

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REPORTS ON INSECTS OF THE YEAR.

Division No. 1.—Ottawa District. C. H. Young, Hurdman's Bridge.

The season of 1902 in the Ottawa district has been a very poor one for the collector. The writer, outside of some success he had at Meech's Lake, Que., during a six week's stay, took very few acceptable things.

The very cold and wet season, especially in May and June, doubtless was the cause of such a poor year. In August, which month I spent at Meech's Lake, however, I was fortunate enough to capture a good number of interesting species, some mention of which I will make afterwards.

The most noticeable injurious insect of the season around Ottawa was doubtless the Birch Skeletonizer (*Bucculatrix Canadensisella*) which was so abundant last year, and which, the present season, seemed to do just as much damage to birches of all kinds. It was this year accompanied, however, by numbers of a large, grayish green aphid, and the damage was specially noticeable towards the end of August.

Garden crops were attacked to some extent in this district. The Onion Maggot was very troublesome in some places and caused considerable loss.

Asparagus plants in my garden were rather seriously attacked by the larvæ of *Peridroma occulta*, one of the large noctuid moths. This caterpillar when mature is a large cutworm, and is very voracious, feeding at night, and hiding in the earth at the foot of the plant during the day. Towards the end of September a neighbour of mine brought me some specimens of the Tomato worm (*Protoparce celeus*), Fig. 19, saying that they were doing damage to the foliage of his tomato plants. I immediately went over to his place and in two rows, one about a hundred feet long, the other about fifty, I collected 59 specimens of this caterpillar. On the 1st July I noticed three insects resting on the stem, of a leaf of vegetable marrow, and on collecting them was surprised to see that they were genuine specimens of the Squash Bug, Fig. 20. Dr. Fletcher in his report for 1901, says, "This bug is very rare indeed at Ottawa: Twenty years ago, two specimens were taken here by Mr. W. H. Harrington and none were seen since, although looked for carefully, until the past season, when a few specimens were taken." Dr Fletcher recommends:

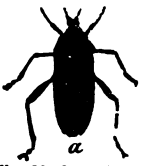


Fig. 20. Squash-bug.

(1.) "Hand-picking, early in the season, of the old bugs when they first resort to the plants, and also of the easily seen egg clusters. This requires an inspection of the vines every day or two. The young bugs may be easily destroyed with a spray of kerosene emulsion, or of whale-oil soap.

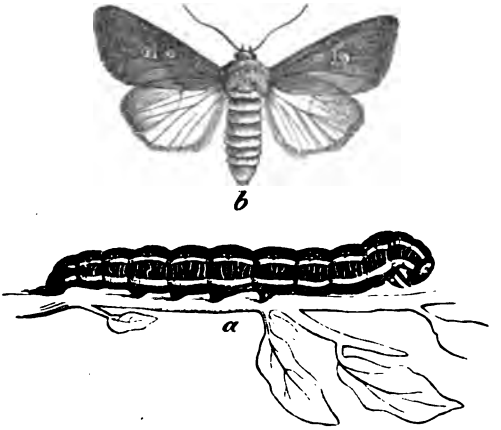


Fig. 21. Mamestra picta: *a*, Zebra caterpillar; *b*, Moth.

(2.) Trapping,—This consists of placing at intervals through the plantation, shingles or pieces of board, beneath which the bugs gather for shelter. By examining these every morning, many may be captured. In a season when the bugs have been abundant, all vines should be burnt as soon as the crop has been gathered. In this way, many of the insects in all stages of development will be destroyed."

The Caterpillars of the White Cabbage butterfly were not so numerous as last year but caused, however, some harm in turnip and rape fields, as did also the Zebra caterpillar (*Mamestra picta*) Fig. 21, which was

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fairly abundant. Early in the year hundreds of cut-worms of *Noctua fennica* were present in clover fields but I have not heard of their having done serious damage.

During the season considerable attention has been given to studying life histories, particularly of lepidoptera. Many specimens have been reared and some additions made to our knowledge of common species.—Some of the results of this work are submitted herewith showing the larvæ, pupæ, and perfect insects and in some cases parasites also of :—

Hydræcia cataphracta .....In burdock. (*Lappa major.*)
Gluphisia trilineata .....On Aspen. (*Populus tremuloides.*)
Edema albifrons.....On Oak.
Lycomorpha pholus.....On lichen on rocks.
Eudryas grata.....On grape vines.
Metzeria lappella .....Seeds of Burdock.
Euplexia lucipara.....Ferns of all kinds.
Peridroma occulta .....Injuring asparagus.
Mamestra legitima.....On asparagus and clover.
Papilio asterias.....On parsnip, celery and carrot.
Sphinx eremitus.....On Mentha and Monarda.
Notodonta stragula.....On hazel nut.
Leucania albilinea.....On grass and clover.
Pyrameis huntera.....On Pearly Everlasting.
Calocampa curvimacula ... .On Apple.
Arctia virgo.....On Plantain, dandelion, etc.
Synchlora rubrifrontaria.....On *Quercus macrocarpa.*
Feniseca tarquinius..... On *Schizoneura tessellata.*
Ichthyura albosigma..... .... On Aspen. (*P. tremuloides.*)

The following species have also been reared.

Basilarchia disippus.....from egg.....On Willow.
Grapta progne..... " .....On Wild Gooseberry.
Xylina Bethunei ..... " .....On Apple.
Xylina disposita ..... " .....On Apple.
Xylina Grotei .... " .....On Maple.
Ypsolophus pometellus..... On Apple.
Hyperchiria Io ..... On Aspen and basswood.
Mamestra picta ..... On Turnip
Noctua fennica .. .. On Clover.
Noctua collaris .... On Clover, grasses, etc.

I noticed in examining the collections of the Society last year that some of the specimens are faded or imperfect. I have therefore much pleasure in presenting the following which I trust may be found acceptable :

Larvæ of Mamestra picta, Calocampa curvimacula, Noctua fennica, Xylina Bethunei, Xylina disposita, Orgyia leucostigma, Datana ministra ; Moths of Eudryas unio, Lycomorpha pholus (2), Epirranthis obfirmaria (2), Mamestra lorea (2), Abrostola urentis, Alaria florida, Hadena verbascoides, Xylina pexata (2), Cirroedia pampina ; larvæ of Papilio asterias.

Division No. 2.—Bay of Quinte. By J. D. Evans, Trenton.

No cases of serious injury from noxious insects came under the writer's notice, although late in the season *Colias philodice* (Fig. 22) and *Pieris rapæ* (Fig. 23) were quite numerous, flitting about the clover fields containing the ripened second crop.

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Much damage has been caused, however, to some orchard and farm crops from the unusual character of the season throughout this section; it having been generally speaking extremely wet and remarkably cool. The principal crops thus severely injured are the apple, clover, potato, corn and tomato. The first mentioned (apple) is very abundant, but the fruit is being destroyed by a fungus growth, which may not appear to be of much consequence when the apples are being packed but develops enormously in a short time and renders the fruit unfit for sale. A sample is herewith submitted of a test case, where a fruit packer put up a barrel of choice apples which had insignificant looking spots when packed; they were packed in the usual careful manner, placed on board of a steamboat and left under the usual conditions of transhipment on board for three weeks, at the expiration of that time they were opened up and found to be covered with the large scabs which appear on the samples exhibited. [The sample apples shown were so damaged as to be perfectly worthless.]



Fig. 22. Colias philodice. Colours: yellow and black.



Fig. 23. Pieris rapæ. Colours: white and black.

The potato crop is almost an entire failure owing to a blight which struck the vines when in bloom and developed into rot in the tubers.

A large proportion of the red clover hay was partially, and in cases wholly, spoiled in the curing owing to the continuous rains prevalent at that time. From a like cause coupled with the low temperature, corn and tomatoes, which are grown in large quantities for canning purposes were, generally speaking, a failure.

Division No. 3.—Toronto By E. M. Walker.

During the present year but few observations were made by the writer on the ravages of injurious insects, owing to a necessary absence from the city during a large part of the season,

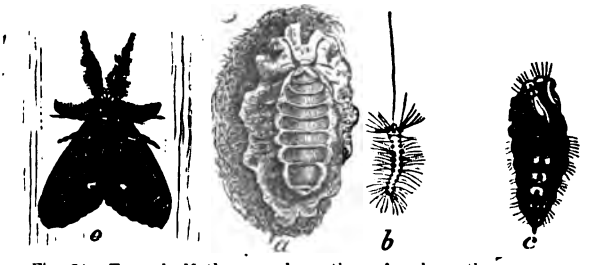


Fig. 24. Tussock Moth: *e* male moth; *a* female moth on cocoon; *b* young larva; *c* chrysalis.

and being fully occupied with other matters during the remainder. A few of the most prominent pests were noted, however, though doubtless many species of equal importance escaped observation.

Tent caterpillars (*Clisiocampa Americana*) were not specially bad this year. A few were seen on the wild black cherry early in the season but fruit trees on the whole have been comparatively free from them.

Another enemy of the apple, the Codling moth (*Carpocapsa pomonella*) committed considerable injury this season, and in one orchard, for example, on Davenport Road, evidences of its presence could be detected in about seventy-five per cent. of the apples.

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The Tussock moth (*Orgyia leucostigma*) Figs 24 and 25, is still by far the most formidable enemy of our shade trees although it appears to be gradually diminishing in numbers and was distinctly less abundant than it has been during the past three or four years. Very few trees were observed that were completely stripped or nearly so, though in the lower part of the city there were a good many badly disfigured trees. Very little has yet been done to control its ravages.

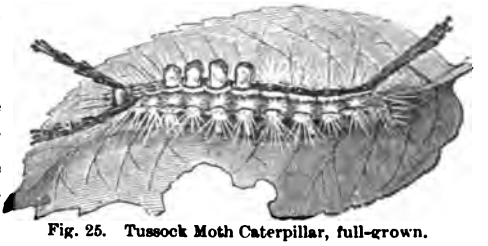


Fig. 25. Tussock Moth Caterpillar, full-grown.

On the above property there was a large plantation of red currant bushes, which, at the time they were seen by the writer (August 15) were almost completely stripped by the larvæ

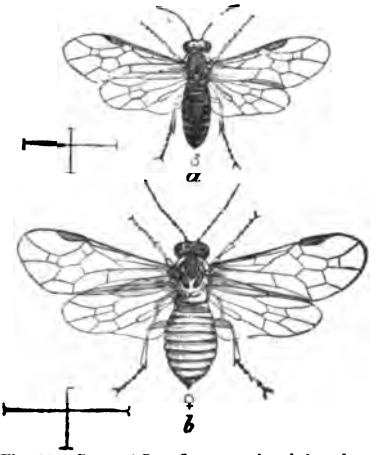


Fig. 26. Currant Saw-fly : *a* male ; *b* female.



Fig. 27. Currant Saw-fly caterpilars.

of the imported currant Saw-fly (*Nematus ventricosus*) Figs. 26, 27 and 28. They occurred in ultitudes and in various stages of development, and although the currant bushes were nearly bare of foliage, an adjacent patch of gooseberries was almost entirely free from the pest. Notwithstanding the condition of the foliage the fruit was abundant and of large size.

About the middle of May a large number of Pin cherry trees (*Prunus Pennsylvanica*) in High Park were found to be badly attacked by the Cherry Aphis (*Myzus cerasi*) the leaves at the ends of the branches being very much crumpled and disfigured. Subsequently they were found plentifully on the wild black cherry and also on the cultivated cherry.

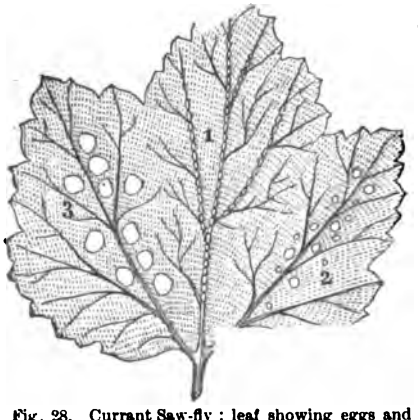


Fig. 28. Currant Saw-fly : leaf showing eggs and holes eaten by the young larvæ.

The Cabbage Butterfly (*Pieris rapae*) has been exceedingly abundant this summer and has caused a great deal of damage to cabbages and allied vegetables in this locality. On August 15, while inspecting a large market garden north of the city, the writer observed great numbers of the larvæ in all stages on a large bed of cabbages. They were to be found practically on every head, and many plants were quite unmarketable. An adjacent bed of cauliflowers was but little affected, though a few caterpillars were found on some of the heads. In another bed of cabbages only a few hundred yards distant from the one just referred to, the caterpillars were much fewer in numbers though plentiful enough.

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The only other serious pest noticed attacking garden vegetables was the Potato Beetle (*Doryphora 10-lineata*, Say), which occurred in distressingly large numbers on potatoes, though tomatoes as far as the writer observed were pretty free from them.

An insect injurious to shrubs and shade-trees which seems to be on the increase lately is *Ormenis pruinosa*, a large stoutly-built leafhopper resembling a small bluish grey moth. I first noticed them in large numbers in 1901 on some shrubs which were planted in the spring of the same year. This year they were everywhere and showed themselves to be possessed of by no means a restricted appetite. While most abundant on the Virginia creeper and grape-vine they were common on many other shrubs and trees, etc., such as the elm, maple, basswood, gooseberry, almond, Tartarian honeysuckle and rhubarb. The larvæ are whitish creatures not much like the adults in appearance, and have the habit of arranging themselves in irregular rows along the smaller branches and twigs, the whole aggregation being partly enveloped in a white flocculent material. The full-grown insects were first observed towards the end of July and remained until the beginning of October. Late in September they could be seen resting on the trunks of almost every shade tree except horse chestnuts, upon which they were very scarce and were probably accidental.

Among the insects which were abundant last year but have not been troublesome this season the Birch Bucculatrix (*Bucculatrix Canadensisella*) is noteworthy. The trees have been quite healthy the whole of this year, though in May I noticed that some of them were rather badly infested with a large species of aphid. Butterflies on the whole have been scarce according to the statements of local collectors, and two of our most destructive grasshoppers *Melanoplus atlanis* and *Camnula pellucida* were not nearly so numerous as usual, probably owing to the wet season, since both species thrive best in hot dry weather.

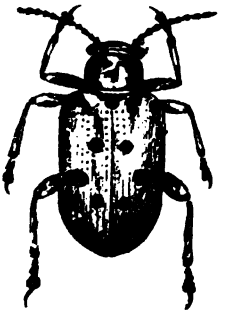
Division No. 5—London District. By J. A. Balkwill.

I am very happy to report that we have not had any insect visitations of a serious nature in this district during the past season.

Last winter my attention was called to some larvæ which were doing considerable injury to hay in barns in a part of London Township. They were so plentiful that I collected over 30 of them from a small handful of hay, and Mr. Moffat kindly identified them as the Dry Clover Moth (*Asopia costalis*), Fig. 29. By spinning their webs over the stems of the hay, they made it so unpleasant that horses and cattle did not care to eat it, and it thus caused a serious loss to those in whose barns it was found.



Fig. 29. Clover Moths, Caterpillars and Chrysalis.


Fig. 30. 12-Spotted Asparagus Beetle (greatly magnified).

In August, during our Horticultural Society's Flower Show, Mr. Butler, St. George Street, London, asked me if I knew a beetle that attacked the asparagus; from his description I suspected that it was new, and therefore asked him to bring me some of them, which he did the next day. On shewing them to Dr. Bethune, who is always willing to oblige, he identified them as the Asparagus beetle *Crioceris 12-punctata* (Fig. 30). This, I think, is the first record of this insect for the London district.

The Codling Moth has not been as much in evidence this season as formerly, no doubt caused by the cold, wet weather, and this, I think, is the reason that insects in general have not been so plentiful as usual, mosquitoes excepted.

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The Datana, which did so much injury to Black Walnut and Hickory trees last year, appeared again this season, but in very much smaller numbers, and the damage was very light.

The Buffalo Carpet Beetle (Fig. 31) has become a serious pest in this district, and causes great loss in carpets and other woollen articles. To give an idea of how plentiful they are, I may mention that on one bush of Spiræa in 5 days I collected over 100 beetles.

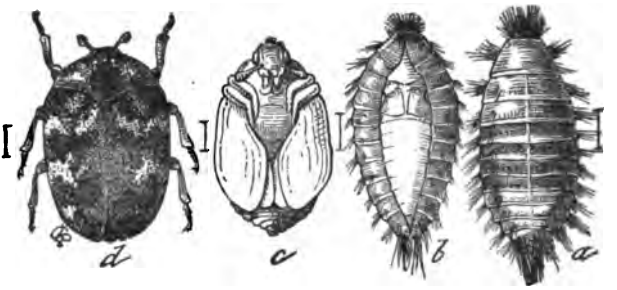


Fig. 31. Buffalo Beetle. *a*, larva (destructive stage) ; *b*, pupa within larval skin ; *c*, pupa ; *d*, beetle—all much magnified.

In the discussion which followed the reading of the Directors' reports, Prof. Lochhead remarked upon the progress of the Asparagus beetles. *Crioceris 12-punctata* (Fig. 30) had taken the lead of the other species, *C. asparagi* (Fig. 32), in their westward movement, while in the neighboring States the opposite was the case. Last year they had reached Guelph, the former species being much the more abundant, and now it alone had arrived at London. Dr. Fletcher stated that in the Niagara District both species were equally abundant, and he thought it remarkable that the 12-spotted beetle should have moved faster than the other. The asparagus rust he found very injurious last year at Ottawa, but this year there was very little of it. Mr. Balkwill had observed the same thing in gardens in London, where much injury had been caused by rust last year it was not noticeable this summer ; he also stated that the Codling Moth was very little in evidence in this neighborhood. Mr. Fisher asked how it was that the Codling Moth was so rare in the District referred to. Mr. Balkwill said that he could not account for it, as the owners of orchards had done no spraying. Mr. Fisher thought that the diminution in the numbers of the insect must have been caused by the small crop of fruit last year, which deprived it of a sufficient supply of food, and therefore prevented a large number of the worms from attaining their maturity. He then asked what steps should be taken to control the Asparagus beetles. In reply it was stated that good results had followed from dusting the plants regularly with fresh lime when the larvæ were upon them.

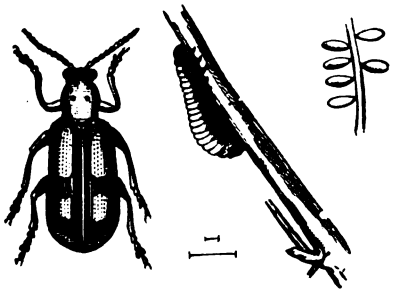


Fig. 32. Asparagus Beetle, larva and eggs.

Dr. Fletcher, in reference to the Codling Worm (Fig. 33) urged very strongly the importance of spraying during such a year as this, when their numbers were fewer than usual. We now had the enemy at its weakest, and could without much difficulty reduce its numbers to such an extent that it would take some time to become abundant again. Furthermore, good fruit brings a high price ; it pays well, therefore, to persevere in spraying. He considered that the reduction in the numbers of the insect was due to the cold, wet season, the small food supply and the extended use of spraying throughout the country. Among the enemies to this fruit, he mentioned the Apple-Weevil (*Anthonomus quadrigibbus*), Fig. 34, which he had found also in wild haws, and the Plum Curculio, which often attacks apples.

Mr. Fisher spoke of the best means of controlling the Codling moth ; he considered the bandage system the most effective of all, but the bandages must be removed at least every ten days and the bark beneath them scraped. If this is not done, the bandage proves the most

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convenient and safest place for the worm to change into a chrysalis, and thus far more harm than good is done. He strongly recommended three things—first, spray with Paris green during the first week after the blossoms have fallen, later than that is of no use ; second, bandage the trees and remove regularly ; third, keep hogs in the orchard to eat up the fallen fruit and thus destroy the worms contained in it.

Dr. Fletcher said that spraying, properly done, saved seventy-five per cent. of the fruit. East of Toronto there was only one brood of the Codling moth in the year and therefore bandaging the trees was of no use, but west of Toronto there were two broods per annum, the second being much the worst, and there bandaging produced excellent results. The bandages should be passed through a clothes-wringer which could be carried in a wheelbarrow from tree to tree, or they might be dipped into scalding water. The worms, however, will not all be found in the bandages, for about half of them burrow into the bark ; these can be got rid of by scraping with a wire brush which effectually tears them out of their burrows. He considered burlap or sacking the best material for the bandage and straw the very worst, because it is so hard to put on and makes such a litter in the orchard. One or two thicknesses of burlap, five or six inches in width, tied in the middle with a string, makes a satisfactory bandage. Hogs were very useful in the orchard to devour the fallen fruit. The moth

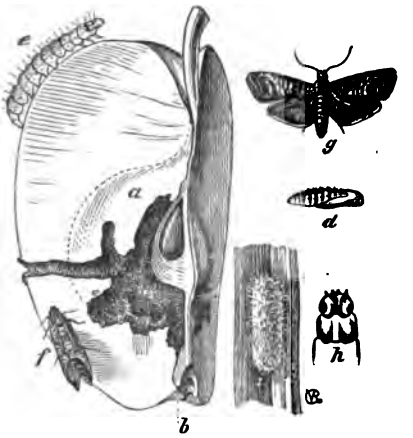


Fig. 33. Quarter of an Apple shewing the work of the Codling Worm ; the insect in all stages.

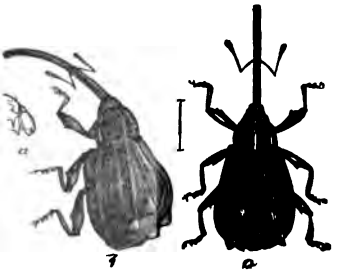


Fig. 34. Apple-Weevil (greatly magnified).

did not lay her eggs till the fruit was about the size of a pea and continued laying till it was as large as a hickory nut ; during this period spraying should be done.

Mr. Fisher said that the calyx (at the tip of the young fruit) closes about a week after the blossom falls, and therefore it is necessary to spray early.

Prof. Lochhead found the Haseltine trap-lanterns perfectly worthless as regards the destruction of the Codling moth. They caught as many beneficial as injurious insects, but no Codling moths. "The Expansive Tree-protector" is all right in principle, as it is a bandage, but he found in nearly every instance that it was doing harm to the tree. The poisonous substance with which the felting is soaked was not effective ; the Codling larvæ were lively and active in it, also spiders and other insects which took advantage of the shelter. He had also found larvæ crawling over the sticky substance which was supposed to be a complete barrier against them. The worst feature about it is that it is said to expand automatically with the growth of the tree ; he found that it failed to do so, but gradually cut right into the wood through the bark and in time girdled the tree ; this could only be prevented by frequently opening and moving it. Sacking or burlap was ever so much better, as well as cheaper and simpler. He was surprised to find how remarkably active the agents have been in selling these "protectors" ; they were to be seen in orchards all over the country.

Mr. Evans said that in his trap-lantern (described in the last Annual Report) he had caught a great variety of insects, but no Codling moths. They are evidently not attracted by light

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Mr. Walter Smith related his experience with bandages, and said that the main cause of failure in their use is that people will not take the trouble to remove them regularly and then they become excellent hiding places for the worms.

Mr. Fisher found it a good plan to drive two nails into the tree and leave them there; the string of the bandages could be twisted around them and released when the bandages were taken off in much less time than was required for tying and untying.

Mr. Balkwill spoke of the scarcity of clover seed this year, and wished to know whether this could be attributed to the destruction of the crop by the clover-seed weevil (*Phytonomus punctatus*); his own opinion was that the scanty supply of seed was due to the character of the season. The weather had been continuously cold and wet, so that the blossoms did not open and consequently the flowers were not fertilized.

Dr. Fletcher said that he had found the weevil abundant in British Columbia this year. Dr. Bethune stated that last year it was very numerous in London but this year he had not seen a single specimen.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for the year 1901-2.

The thirty-eighth annual meeting of the Society was held in London in November, 1901, and was well attended by members from a distance as well as those resident in the city. It was also favoured with the presence of the Hon. J. Dryden, Minister of Agriculture for Ontario, and Mr. G. C. Creelman, Superintendent of the Farmers' Institutes of Ontario. During the first afternoon a conference was held to discuss the progress, present aspect and future outlook of the San José scale in Ontario. In the evening a public meeting was held in the Normal School; the chair was taken by the Hon. J. Dryden, who delivered the opening address. The Rev Dr. Fyles then read his presidential address on "The Importance of Entomological Studies to the Community at Large," and illustrated his remarks with beautiful coloured diagrams, the work of his own hand. Dr. Fletcher followed with an address on "The Value of Nature Study in Education," and concluded with an exhibition of lantern slides of plants, insects and other natural objects of interest. The following day was occupied with the reading of papers and the reports of the officers, branches and sections of the Society.

The thirty-second Annual Report on economic and general Entomology was presented to the Minister of Agriculture for Ontario in February last and was printed and distributed in the beginning of May. It contained 128 pages and was illustrated with three maps and fifty-eight figures in the text, a photogravure portrait of the late Miss Eleanor A. Ormerod and a very beautiful full-page plate of thirty-three varying specimens of *Hyphantria cunea* kindly contributed by Mr. Henry H. Lyman in illustration of his paper on "The North American Fall Web-worms." Besides the account of the conference on the San José scale and the proceedings at the annual meeting, the Report contained papers on the injurious insects of the year by Messrs. Young, Evans, Johnston, Lochhead and Moffat; "The Painted Lady Butterfly" and the "Entomological Record for 1901," a new feature which is to be continued annually, by Dr. Fletcher; "The trend of Insect diffusion in North America," the "Imported Willow and Poplar Curculio," and "The Common Cheese-mite living in Sporotrichum globuliferum," by Prof. F. M. Webster; papers by Prof Lochhead on the "Hibernation of Insects" and "Nature study Lessons on Mosquitoes"; by Mr. Moffat on "Anosia Archippus does not Hibernate"; by Mr. Evans, on "Collecting at Light"; Mr. Winn, on captures made at "The Milk-weed at Dusk"; Mr. Walker, on "A Collecting Trip in South-Western Ontario"; Mr. Gibson, on "A Day at the Mer Bleue." Dr. Fyles contributed a paper on "Crickets,"

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and Mr. J. B. Williams, on "The Food of the Grass Snake." The volume closed with a report from the North-West (Canada) Entomological Society and obituary notices of the late Miss Ormerod and Mr. Otto Lugger.

The *Canadian Entomologist* has been regularly issued at the beginning of each month. The 33rd volume was completed in December last; it consisted of 348 pages, illustrated with five full-page plates and eleven figures from original drawings. The contributors number sixty-two and represent Canada, the United States, England, Germany, Luxembourg and India. Of the 34th volume ten numbers have thus far been published; those for November and December will be duly issued at the beginning of their respec ive months.

During the greater part of the year meetings for the study of Entomology have been held on Tuesday evenings, followed during the summer months when the weather was favourable by collecting excursions on Saturday afternoons. The Geological Section has met regularly on Thursday evenings; the Ornithological once a month on Fridays; the Microscopical on alternate Saturdays during the winter and the Botanical during the summer and autumn. The reports of these Sections, giving a record of their proceedings, will be read at this meeting and be published in the next Annual Report of the Society.

The good work of the Society has been much extended by the delivery of popular lectures by several of the members. Dr. James Fletcher has given a large number on insects, noxious weeds and nature study in various places in Ontario, Quebec, the Maritime Provinces, Manitoba, the North-West Territories and British Columbia, in fact from one end of the Dominion to the other. Dr. Bethune has lectured, chiefly to school children and horticultural societies, in London and a number of towns not far distant, on noxious, interesting and beneficial insects. Mr. W. E. Saunders has addressed teachers and other assemblies in Montreal, Ottawa, London and elsewhere, on "The Birds of Canada." The Rev. Dr. Fyles has given popular lectures on Entomology in Quebec and Levis, P. Que.; and Prof. Lochhead has delivered lectures on entomological subjects in Guelph, Port Elgin, Owen Sound, Beeton, Woodstock and Hamilton.

All of which is respectfully submitted.

THOMAS W. FYLES, President.

REPORT OF THE MONTREAL BRANCH.

The 241st regular and 29th annual meeting of the Montreal Branch of the Entomological Society of Ontario was held in the library of the Natural History Society, University street, on Tuesday evening, May 13th, 1902.

Owing to the absence of the President, due to illness, Mr. Charles Stevenson, Vice-President, occupied the chair.

The minutes of the last meeting were read, and minutes of last annual meeting taken as read and confirmed.

The Vice-President on behalf of the Council read the following report:

REPORT OF THE COUNCIL.

The Council takes pleasure in presenting the following report of the Society's work during the seasons 1901 to 1902:

Nine regular meeting have been held, the average attendance being seven.

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Several field days were held, the principal ones being as follows :—

Point aux Trembles	1st June.
St. Martin Junction	15th "
Outremont	22nd "
St. Hilaire	1st July.

The following papers were read :

The Dissemination of Disease by Dipterous Insects	Charles Stevenson.
Curious Effects of the Attack of an Asilus Fly on *Colias Philodice*	A. F. Winn.
Is *Telea polyphemus* double brooded somewhere ?	Charles Stevenson.
On the Family of Flies called the Syrphidæ	G. Chagnon.
Eggs of *Tolype velleda*	A. F. Winn.
On collecting and preserving micro-lepidoptera	H. H. Lyman.
The Milkweed at dusk	A. F. Winn.
A new *Gortyna* and notes on the Genus	H. H. Lyman.
Coloration of Insects	Graeme M. Stewart, Toronto.
The Asilidæ or Robber Flies	G. Chagnon.
The North American Fall Web-worms	H. H. Lyman.
An Assam Danais and its mimics	Charles Stevenson.
An Hermaphrodite Lycæna	A. F. Winn.
An Introduction to the order Hemiptera	G. A. Moore.
Notes on *Eurosta solidaginis* Fitch	G. Chagnon.
Notes on *Lycæna Scudderii*	H. H. Lyman.
Lepidopterous Irisation	Charles Stevenson.
Remarks chiefly on Hydrœcias	A. F. Winn.

Our staff of members remains practically the same as last year.

Mr. A. E. Norris has kindly offered us room in his place of business to locate there our cabinet and collection. We must all offer to this gentlemen our sincere thanks for the kind assistance he has given us in this way.

Through the generous contribution of several of our members, our collection now amounts to probably 500 or 600 species which practically fill up the dozen drawers we bought at the beginning of the year.

An innovation introduced this year was the filing of all papers read at our meetings so to be accessible for future reference.

The report of the Treasurer will now be submitted to you, and also that of our Curator and Librarian who will give you many details as to the exact condition of our collection of insects.

Submitted on behalf of the Council.

(Signed) G. CHAGNON,
President.

The Treasurer then submitted his report, showing a balance on hand of $47.52.

The Librarian and Curator then presented his reports showing that valuable contributions towards the collections of the Branch had been received ; from Mr. Winn 98 specimens of Lepidoptera and 134 specimens belonging to other orders, from Miss Emily L. Morton a very valuable donation of eight hybrids of her own rearing, from Mr. Chagnon 94 specimens of Diptera representing 51 species, from Mr. Norris 43 specimens of Lepidoptera, from Mr. Stevenson 20 specimens of butterflies, from Mr. Denny 13 specimens of butterflies. Mr. Beaulieu has promised a large number of specimens of Coleoptera and Mr. Lyman a number of Western Lepidoptera.

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The library is still of very modest proportions but the following additions have been made: Howard's "Insect Book," by purchase; "The Crambidæ of North America," by C. H. Fernald, A.M., Ph.D., presented by the author; "Annotated Catalogue of the Butterflies of New Hampshire," by Wm. F. Fiske, presented by C. M. Weed through H. H. Lyman.

It was then moved by Mr. A. Griffin, seconded by Mr. A. F. Winn, that the reports be received and adopted. Carried.

The Secretary then read the Annual Address of the President, after which the election of officers for the ensuing year took place with the following result: President, Charles Stevenson; Vice-President, A. E. Norris; Librarian and Curator, A. E. Norris; Secretary and Treasurer, G. A. Moore; Council, Henry H. Lyman, G. Chagnon, D. Brainerd.

On motion of Mr. Lyman, seconded by Mr. Griffin, the night for meetings was changed from the second to the first Tuesday in the month, as in the early years of the Branch.

On motion of Mr. Lyman, seconded by Mr. Winn, $5.00 was voted for the purchase of early volumes of *The Canadian Entomologist* for the Branch Library.

Messrs. Stevenson, Chagnon and Winn were elected a Field Day Committee.

Mr. Lyman then presented 55 specimens of Lepidoptera, chiefly western, for the Branch Cabinet.

Mr. Lyman read a paper entitled "What is a Genus?"

Mr. Norris then exhibited, with the help of Mr. Griffin and the lantern of the Natural History Society, a collection of excellent coloured slides of Lepidoptera.

On the adjournment of the meeting the members were entertained with refreshments by Mr. Griffin.

G. A. Moore,
Secretary.

REPORT OF THE QUEBEC BRANCH.

President's Report.

The Quebec Branch of the Entomological Society of Ontario has entered upon the sixth year of its existence.

We still have a goodly number of members though several of our young people have entered business houses and can no longer give attention to entomology. Some of our members have moved to distant parts of the country and some have been taken away by death. We here record with sorrow the demise of Miss Bella Thompson. After a long illness, borne with much patience and resignation, she departed this life on the 22nd of June last. The friends of this lady have our deep sympathy.

The weather during the past season has been remarkably variable—too cold and wet for insect life to flourish. We had, however, a very enjoyable field day on the 9th July at the Island of Orleans. But few insect captures were made, but some pleasant hours were spent in the grounds of Mr. and Mrs. Morgan and those of the Hon. R. and Mrs. Turner. On this occasion we found the oak trees infested with the Snout-beetle *Balaninus nasicus*, Say.

A specimen of the rare wasp, *Vespa rufa*, Linneus, was taken on the island, and a nest of *Vespa Germanica*, Fabr, was discovered there.

Vespa arenaria, Fabr, was abundant in the woods round Fort No. 2, Levis, in August; and *Pamphila Manitoba*, Scudder, was seen in the same month and in the same locality.

A tortoise beetle new to the province has appeared at Levis this year. It feeds upon the burdock and the Canadian thistle Specimens of this insect have been sent to the British Museum for identification.

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REPORT OF COUNCIL.

The Branch now includes 32 members (24 adults and 8 juniors.)

The treasurer's report is submitted, and will no doubt be found satisfactory.

The continued rainy weather of last summer prevented the members from having many field-days but a very enjoyable one was held on the Island of Orleans on the 9th July.

Our thanks are due to the authorities of Morrin College for having continued to allow us the use of their rooms for our meetings.

CRAWFORD LINDSAY,
Sec-Treas.

The following were elected officers:—President, Rev. Dr. Fyles ; Vice-president, Miss E. MacDonald ; Council, Hon. R. Turner, Rev. F. G. Scott, Mrs. R. Turner, Miss Bickell, Miss Freeman ; Secretary-Treasurer, Lt.-Col. Crawford Lindsay.

REPORT OF THE TORONTO BRANCH

Of the Entomological Society of Ontario for the year 1901-2, ending April 30, 1902. [Read at the Annual Meeting, held in the Education Department Building, May 16th, 1902. Mr. E. M. Walker, vice-president, in the chair.

GENTLEMEN :

During the past year ten meetings have been held, and the following papers have been read before the Society :—

" A Collecting Trip in South-western Ontario" ....E. M. Walker.
" An Evening at the Milkweed "..... . ...A. F. Winn.
" Butterfly Collecting in 1901".....J. B. Williams.
" Some Interesting Lepidopterous Larval Habits".....Arthur Gibson.
" The Canadian Stick Insect"..... .....J. B. Williams.
" On Crickets" .....E. M. Walker.

Two meetings were occupied with the " Exhibition of Specimens," and at the special meeting in November addresses were given by Mr. Arthur Gibson and Dr. Fletcher, of Ottawa, and by Mr. H. H. Lyman, of Montreal, these gentlemen having kindly arranged to be present on their way back from the London meetings. A number of the Natural History Society members came to this meeting, as well as those of our own Branch, and a very pleasant evening was spent in listening to and conversing with our three visitors.

We arranged for a Field Day to High Park on the 24th of May, 1901, but, unfortunately, the weather made any expedition of this kind impossible ; however, we subsequently went to High Park for the afternoon of June 22nd, and had an interesting and successful afternoon.

A number of additional drawers in the Education Department museum have been corked and glazed for the collection of insects that the Society is making for the Department, and we have now plenty of space to re-arrange the collection in a satisfactory manner, and provide room for all the orders.

The Orthoptera, Odonata and diurnal Lepidoptera have already been re-arranged.

We have subscribed for the " Journal of the New York Entomological Society," the " Entomological News" and the " Bulletins of the New York State Museum.".

The Branch presented a series of the very beautiful plates of scale insects, from Bulletin No. 46, to the Education Department museum, and Mr. Boyle, the Superintendent of the museum, has had them framed and hung up in one of the rooms.

Valuable papers on entomological subjects have also been received from the Central Experimental Farm at Ottawa, the United States Department of Agriculture at Washington, and from several other sources.

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The attendance at our meetings is but small, and we have only added one new name to our membership during the year. Most societies of this kind, however, have their "ups and downs," and we must hope that by next year we shall be able to report that the attendance and membership are going up.

E. M. WALKER, Vice-President.
J. B. WILLIAMS, Sec-Treasurer.

TORONTO, May 16th, 1902.

The following officers were elected for the present year :—President, E. M. Walker ; Vice-President, G. M. Stewart ; Secretary-Treasurer, J. B. Williams ; Librarian and Curator, J. H. Webb ; Members of Council, Arthur Gibson, John Maughan, jr.

REPORT OF THE TREASURER.

Financial Statement of the Treasurer of the Entomological Society of Ontario for the year ending August 31st, 1902.

RECEIPTS.		EXPENDITURE.	
Balance from previous year	$ 483 05	Printing	$ 731 34
Members' fees	388 22	Expense, Annual Meeting & Reports	270 97
Government Grant	1,000 00	Salaries	375 00
Proceeds from sales, Pins, Cork, &c	14 23	Rent	165 00
Proceeds from sales, Entomologist	130 25	Library	36 98
Advertising	28 43	Expense—sundry	66 03
Interest	15 32	Balance	414 18
Total	$2,059 50	Total	$2,059 50

Auditors : { W. H. HAMILTON. J. A. BALKWILL.

Treasurer : JAS. H. BOWMAN.

REPORT OF THE LIBRARIAN AND CURATOR.

FOR THE YEAR ENDING 31ST OF AUGUST, 1902.

38 volumes were added to the Library during the year, made up as follows :—

Twenty-one bound volumes of Government Reports, Proceedings and Transactions of Scientific Societies, Institutions, &c., the most important of which is, the 21st Annual Report of the U. S. Geological Survey for the Years 1899 & 1900, in seven large volumes, profusely illustrated, with maps, and accompanying them was, the Geological and Mineral Resources of the Copper River District, Alaska ; also, Reconnaïssances in Cape Nome and Norton Bay Regions, Alaska, 1901.

By purchase : The three first volumes of the Lepidoptera Phalænæ in the British Museum, with plates. By Sir George F. Hampson, Bart.

By exchange : The first two volumes of British Lepidoptera. By J. W. Tutt, F.E.S. Twelve volumes were bound, bringing the total number of volumes now on the Register up to 1,760.

41 books were issued to local members during the year.

Some valuable additions were made to the Society's native collection ; and several rare and interesting specimens were secured in this locality, whilst some indicate the spread of injurious species.

Respectfully submitted.

J. ALSTON MOFFAT.

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REPORT OF THE BOTANICAL SECTION.

The Botanical Section met for organization on 31st May, when the following officers were elected for the year 1902:—Chairman, Rev. Dr. Bethune; Vice-Chairman, J. Dearness; Secretary, J. A. Balkwill.

The attendance at the meetings, which were held every second week, was very good, and a considerable interest has been maintained during the season.

An outing to Thompson's bog was held on July 11th, but, owing to the wet weather, only a small number attended. The bog was overflowed with water, and many parts could not be visited. A number of interesting plants were brought home, but no new plants were discovered.

Mr. J. H. Bowman reported an outing by Rev. T. C. Scott and himself, when the following fungi were gathered, cooked and eaten: *Cantharellus cebarius, Russula heterophylla, Psaliota placomyces, Lycoperdon cyathiforme*; also having seen a very large *Amanita muscaria*, with a number of dead insects near by, killed by eating the poisonous mushroom.

During the season a large number of plants were brought to the meetings, examined and identified.

J. A. Balkwill,
Secretary.

REPORT OF THE MICROSCOPICAL SECTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Microscopical Section of the Entomological Society of Ontario takes pleasure in presenting its twelfth annual report.

Since the last annual report five new members have been added to the membership roll of the Section, namely: Messrs. C. W. Horton, G. Escott, N. Beal, J. Tanton and C. Parsons.

The re-organization meeting was held on the Twenty-eighth of September, 1901, when the following officers were elected:—

Prof. Jas. H. Bowman.....Chairman.
Prof. J. Dearness.....Vice-Chairman.
Mr. E. A. Brown.....Secretary.
Profs. Bowman & Dearness and Mr. C. W. Horton.....Executive Committee.

During the past winter (the Microscopical Section resolves into the Botanical Section during the summer months) sixteen regular meetings were held, with an average of ten members, as well as visitors. At the request of the Students of the Western University, a number of the members of the section assisted in the programme at the annual Conversazione. In addition to the exhibition of a number of the slides in the Society's collection, Prof. Dearness demonstrated "Life in a Drop of Water" and "Circulation of Blood;" Dr. Bethune exhibited a number of slides of Insects or their parts, while Prof. Bowman prepared Crystals on the spot and, by means of the polariscope, brought out their beautiful colors.

From time to time throughout the season papers were read or addresses given on the following subjects:—

Pond Life.....Prof. Bowman.
How Best to Mount Seeds for Microscopic Examination.....Prof. Dearness.
On the Theory of Colored Light Rays.....Prof. Bowman.
How Best to Mount Sections of Cloth.....Prof. Bowman.
On Sertularia.....E. A. Brown.

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Microscopic Examination of Plant Hairs.....Prof. Bowman.
On the Wet Mounting of Pollen.....Prof. Dearness.
On the Dissimilarity of the Muscular Tissue of an Insect and a Higher Animal..Prof. Dearness.
Mono-bromide of Camphor Crystals and Methods of Making and Mounting....Prof. Bowman.
Notes on the Life History of Trichina Spiralis.....Prof. Dearness.
Practical Study of Branchippus, Cyclops and Cyprus.....Prof. Bowman.
Properties of the New Metal Radium.....Dr. Bethune.
The Respiration of Spirigæ.....Mr. R. W. Renpie.
On the Local Distribution of Riccia Natans.....Prof. Bowman.
On the Way in Which Riccia Natans Passes the Winter.....Mr. R. W. Rennie.

In addition to the above papers, the members exhibited many beautiful slides of crystals, sections of wood and insects.

At one of the meetings Mr. Law drew the attention of the Section to the difference in composition of specimens of sand from Santa Pensacola (Florida) and Sable Island. The granules of the former were sharply cut, of a whitish color, making beautiful polariscopic objects, while the latter were found to be composed of Silica stained by the action of some metallic oxide and presented a rounded appearance. Dr. C. Abbott, who for some time has been conducting experiments in Micro-photography, exhibited some interesting and instructive photographs, which go to show the advantages to be derived from the union of the Microscope and the Camera.

It is the earnest desire of each member that, during the near future, there may be a large increase in the ranks not only of this Section, but of all societies that have for their motive the advancement of science, for the field of observation and study is large, while as yet the laborers are comparatively few in number.

All which is respectfully submitted.

JAS. H. BOWMAN, Chairman. EDGAR A. BROWN, Secretary.

REPORT OF THE ORNITHOLOGICAL SECTION.

During the year just past the Ornithological Section has held nine regular meetings at which the attendance has averaged over six.

At these meetings many interesting subjects have been brought up and discussed and many valuable notes recorded. One bird new to Canada was reported, viz. the White-eyed Vireo, by W. D. Hobson, Woodstock ; and two others, the King Rail and the American Scoter, which are new to the County of Middlesex, were also noted.

Two Mammals new to this district were also recorded by Mr. Robert Elliott: an undetermined Lemming and the Pine Mouse. Specimens of these were shown at one of the meetings and they were stated by Mr. Elliott to be common, though no one else had succeeded in taking any.

Three families of birds, the Vireos, Swallows and Warblers, have been studied at the meetings and twelve papers have been read ; two of these were published in "The Auk" and most of the others have been or will be published in "The Ottawa Naturalist." These papers were as follows :

"The Bobolink's love for its home"; "The Prairie Horned Lark nesting in New Brunswick"; and "a Hybrid between the Sheep and the Deer," by Wm. H. Moore, Scotch Lake, N. B.

"The American Scoter in Middlesex County;" "Nesting habits of the Ipswich Sparrow"; "The spots on the eggs of the Great Blue Heron;" "Early Nesting in 1902," by W. E. Saunders, London.

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"The Cardinal an established resident of Ontario," and "Cubic contents of the eggs of the Buteos." by J. E. Keays, London.

"Recollections of the Passenger Pigeon," by Dr. Bethune, London,

"The Parula Warbler and its variety," by Robert Elliott, Bryanston.

"The White-eyed Vireo at Woodstock," by W. D. Hobson, Woodstock.

Work has been continued on the list of the birds of Middlesex, which is not yet completed, and the migrations of birds have been studied during their progress as usual.

Since our last report was made, addresses and lectures have been delivered by our members as follows: to audiences in Sarnia, Toronto and Brantford; before the Field Naturalists' Clubs of Ottawa and Guelph; and in London to one assembly of Teachers, two Farmers' meetings and four Church associations.

All which is respectfully submitted.

W. E. SAUNDERS,
Secretary.

Mr. Saunders exhibited specimens of the Lemming referred to in the foregoing report and also of several species of Mice. Prof. Lochhead remarked that the Ornithological Section was performing a very good work, especially by the popular lectures on Birds that were given by some of the members. He noticed that a great interest had been thus awakened at Guelph and would he was sure be long maintained.

REPORT OF THE GEOLOGICAL SECTION.

The Section continued its weekly meetings as heretofore, studies of geological specimens and addresses on geological subjects furnished instruction for the members of the section. A new and most successful feature of the year's studies was a monthly meeting for blow pipe analysis of various minerals. This department was in charge of Messrs. Dempster and Smith. Dr. W. J. Stevenson also gave a most instructive lecture on the tests for a number of minerals by wet assaying. Visits were made to places of interest, as has been the custom in past years. Dr. Woolverton visited the neighborhood of the Sandhills of the Sauble, and discovered a new outcrop of the Hamilton series in that vicinity. Mr. Percival visited the glacial markings on Kelley's Island. Mr Smith the Rainy River and other North-West Ontario districts. Besides these reports made by our own members, interesting descriptions of Temiscaming district were given by Mr. Geo. Taylor, and the Atlin, British Columbia by a resident mine owner of that northern region.

Dr. Woolverton kept the table supplied with numerous interesting specimens to illustrate the papers read.

Articles on geological subjects were read by different members of the section.

Dr. Woolverton's report on the Sandhills of the Sauble summarized was as follows. The sands blown from the beach form hills of a considerable height. The width of district covered by these dunes is about 2 miles. On the edge of the sand ridges a fossil bed of the Hamilton period was observed; numerous specimen of *Zaphrentis prolifica* were visible.

MR. PERCIVAL'S REPORT ON THE GLACIAL MARKINGS OF KELLEY'S ISLAND.

Kelley's Island is situated in Lake Erie off the north coast of Ohio. The glacial groove is situated at the north end of the island in the limestone rocks of the district. The portion of the groove preserved is 33 ft. across and apparently 17 ft. deep. The groove presents a series of corrugations merging into each other by beautiful curves. The whole appearance is that of Corinthian columns lying prostrate side by side. On what is known as "Inscription Rock"

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are sculptures made evidently by the Indians in times long past. The figures denote historical events of deep interest, relating to the conquest of the island by the Iroquois. These sculptures, found on the south side of the Island, were deeply engraved and though now rapidly weathering away, are yet easily traceable.

Mr. Smith's Report on The Eagle Lake Mining Region.

The Eagle Lake District is reached by C. P. R. from Fort William and lies some forty miles east of Rat Portage. Eagle Lake, about where the group of mines and prospects comprising the mining division are located, is some 90 miles in length and ranges from 1 to 13 miles wide. The course of the lake is very tortuous and many islands are met with. The scenery presented by the sheets of pure blue water, granite bluffs and evergreen blanketed hills is of a degree of picturesqueness not soon to be forgotten.

The distributing point of the lake is at Vermilion Bay, a small C. P. R. by-station consisting of half a dozen buildings and shacks. There is another C. P. R. station known as Eagle River on a river of that name tributary to the lake. At the north end of the lake proper a Hudson Bay post is located. A few trappers, prospectors and Indians are the only other representatives of human kind in that great region. The Provincial Department of Crown Lands has surveyed the country sufficiently to make known in a general way the configuration of the lake, but the details of the topography and geology of the land about it are still generally unknown.

It is agreed among students of the subject that what is now known as the "Height of Land" extending through Quebec, Northern Ontario and Keewatin in the form of a horse-shoe reached an altitude rivally that of the Appalachian system which gives shape and position to the eastern half of this continent. Owing to changes of rainfall and temperature, a great tract which centres about the Height of Land came under a thick cap of snow and ice which, in its movements, ground down the hills, filled the valleys and scooped hollows which filling with water became lakes. This theory, which has been very briefly and inadequately put, accounts for the larger features as well as for many of the minor phenomena which characterize our great Northland.

It is the theory of the writer that Eagle Lake owes its existence to a branch of the great Keewatin Glacier, which formed west of Hudson's Bay and several hundred miles due north of the lake.

A careful study of the map indicates that the branch referred to passed in a general southeasterly direction sending lateral divisions to the north-east and south-east. The northern shores of the lake are generally destitute of soil which may be accounted for by the comparatively recent retirement of the glaciers and to water erosion facilitated by the heavy rainfall and the undulating character of land.

A number of rocks picked up by the writer were found to consist of specimens of basic gray granite, red granite, talcose hornblende schists of a green color and black trap.

The gray granite was found 100 feet from the surface. It was overlaid by the red variety which in turn gave place to the green schist. The eruptive rock was found on an island facing the granite and schist outcrop. The formation of the granite in the outcrop was anticlinal *i. e.* tipped upwards from the lake, while the schist layers above appeared to dip in the reverse direction. The basic granite shows clear indications of decomposition in exposed parts where the felspar is broken down into kaolin giving the rocks a whitish cast.

At many points are to be seen the outcrops of quartz veins found either as stringers or as a single vein (which may be two or three feet wide.) When the quartz is in stringers the filling matter is green schist, similar to that before mentioned. The quartz carries small percentages of mineral *i. e.* magnetite or black sand, copper and iron pyrites, zinc blende and

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native gold and silver. By pulverizing the quartz in a mortar and panning, the operator will frequently obtain colors (or minute specks of pure flour gold) in these veins. From a number of them there have been taken near the surface splendid specimens of free gold; some small samples, running as high as fifteen or twenty dollars in gold values, of this kind do not, however appear to obtain at the greater depths.

When the gold is found in a network of fine stringers a disproportionate body of barren matter must be excavated at great expense in order to procure the rock carrying gold. Two miners working in a tunnel are able to take out about a ton per day.

When the quartz-vein is compact, the prospector looks for values on the side adjacent to the foot wall. Assuming the average value per ton to be the same in each case it is obvious that the latter class of prospect could be operated much more economically than the stringer-quartz prospect. In the former the barren material may be left untouched except in so far as its removal may be necessary in the construction of passages. The pay ore may be kept freer of extraneous material involving less cost in transporting and milling. The labor of sorting is also eliminated.

The majority of the prospect mines of the region are as yet prospect claims only. They have for the most part been staked by miners and prospectors of the district who have not the funds wherewith to carry on their work continuously until conclusive results are reached.

If the district is ever to produce gold in paying quantities, capital must be invested there but subject to conditions. If a mine is capitalized to a greater extent than is reasonably necessary to pay expenses for the period during which it is decided to work it, there is usually a great temptation on the part of directors and managers to spend the company funds too lavishly. In the second place if the mine ever pays, its earnings must be divided among a greater number of shares than would be the case if the capital had been less, thus giving smaller dividends. Then the management of such mines must be put in the hands of capable and experienced men, who know all branches of their work thoroughly. Again, operations should at first be carried on on an exceedingly modest scale in order that, if no result obtains, the loss may be at a minimum. Investors may thus feel their way to greater expenditures of money. Most of the prospects contain only a very low grade of ore, so that all machinery introduced should be on that basis.

Summing up it appears to be only necessary for companies forming or about to form with the object of exploiting the region to capitalize moderately, engage trained and efficient men as foremen and superintendents, and to operate on a wholly conservative basis. The district may then become a regular contributor to the gold output of this country.

All which is respectfully submitted

GEORGE B. KIRK,
Chairman.

REPORT FROM THE ENTOMOLOGICAL SOCIETY OF ONTARIO TO THE ROYAL SOCIETY OF CANADA.

(THROUGH THE REV. C. J. S. BETHUNE, D. C. L., DELEGATE.)

The Entomological Society of Ontario has now completed its thirty-eighth year and continues to perform good work of a practical and scientific character. Its membership maintains a steady growth and there is a frequent demand for complete sets of its publications from various parts of the world. Its monthly magazine and annual reports contain the records of so much original research and investigation that they have become essential to the equipment of every tudent in this department of natural science.

During the greater part of the year regular meetings have been held in the Society's room

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at London. On Tuesday evenings several young men have met for the systematic study of insects under the guidance of Dr. Bethune and Mr. Moffat; on Thursdays the Geological Section has continued, with unabated enthusiasm, to discuss the rocks and minerals of the surrounding country; on alternate Saturdays the Microscopical Section has met throughout the winter to investigate the hidden things of nature and study the beautiful forms which cannot be seen with the unaided eye. Once a month, on Fridays, the Ornithological Section, has gathered together at the house of Mr. W. E. Saunders; the numerous papers by its members, published in the *Ottawa Naturalist*, testify to the energy and zeal with which they have devoted themselves to the study of bird life. During the summer the Botanical Section took the place of the Microscopical and held many interesting meetings. One field excursion only was made to Komoka, a favourite collecting ground near London; it was thoroughly enjoyed by the few botanists and entomologists who attended.

The Branches of the Society at Montreal and Quebec, the former of which has flourished for twenty-eight years, report that they have had a very satisfactory season, regular meetings have been held and many excellent and interesting papers were presented; a few field days have also been found very enjoyable and have helped much in stimulating the ardour of those who attend them. The Toronto Branch, like that at Quebec, is now five years old, but it has not received nearly so much encouragement and support as its twin-sister in the lower Province. Why the "Queen City of the West" should furnish so few entomologist is difficult to understand; it has the advantage of many distinguished seats of learning, several extensive libraries, a number of scientific Professors, and a rich and easily accessible country for exploration. Notwithstanding their limited numbers, the members of the Branch have held frequent meetings, at which several excellent papers were read, and have made good progress in the formation of a collection of insects for the Ontario Department of Education.

A noteworthy feature of the Society's work is the delivery of popular lectures by competent members. Dr. James Fletcher has given a large number on insects, noxious weeds and nature study, in various places in Ontario, Manitoba, the North West Territories and British Columbia; Dr. Bethune has lectured, chiefly to school children and Horticultural Societies, in London and a number of towns not far distant, on noxious, interesting and beneficial insects; and Mr. W. E. Saunders has addressed teachers and other assemblies in Montreal, Ottawa and other places as well as in London, on the Birds of Canada. These lectures have been well attended and listened to with great interest, and will evidently do much to awaken and stimulate a love for natural history and a desire to know more about the wonders in plant and animal life that everywhere surround us.

The thirty-eighth annual meeting of the Society was held in London in November last, and was attended by the Hon. J. Dryden, Minister of Agriculture for Ontario, and a number of members from different places. The proceedings opened with a discussion on the San José scale, its ravages in Ontario and the best methods of keeping if under control; much useful information was given by Mr. G. E. Fisher, Provincial Inspector of Scale insects, Dr. Fletcher the Dominion Entomologist and Professor Webster, State Entomologist of Ohio. An evening meeting, to which the public were invited, was held in the Normal School building; the Hon. J. Dryden took the chair and gave the opening address, in the course of which he said that the Entomological Society was one of the best as well as the oldest of the associations aided by the Government of Ontario, that "we need its accurate work and we have been greatly aided and helped by it during all the nearly forty years of its existence, and no doubt shall continue to be helped by it during the years to come". The Rev Dr. Fyles, of Quebec, the President of the Society, gave an address on "The importance of Entomological Studies to the community at large", illustrating his remarks with a beautifully executed series of diagrams, the work of his own hand. He was followed by Dr. Fletcher, who spoke on "The value of nature study in

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Education" and concluded with an exhibition of lantern slides of plants, insects and other natural objects. During the remaining session a number of valuable practical and scientific papers were read, these are published, together with the reports of the Officers, Branches and Sections of the Society, in the 32nd Annual Report recently issued by the Ontario Department of Agriculture.

This volume of 128 pages is illustrated with two plates, a portrait of the late Miss Eleanor A. Ormerod, and a series of figures of the Moth *Hyphantria cunea*, three maps and fifty-eight wood cuts in the text. The principal articles are papers on the Insects of the year 1901 by the Directors, Messrs. Young, Evans and Johnston, and by Professor Lochhead and Mr. J. A. Moffat. "The Painted Lady Butterfly (*Pyrameis Cardui*)" and the "Entomological Record," a new and highly important feature, which is to be continued annually, by Dr. James Fletcher. "The North American Fall Web worms," illustrated by the beautiful plate already referred to, by Mr. Henry H. Lyman. "The trend of Insect diffusion in North America", the "Imported Willow and Poplar Curculio," and a singular case of a Cheese mite living in the culture intended for the destruction of the Chinch-bug, by Professor F. M. Webster. Two useful papers by Prof. Lochhead on the "Hibernation of Insects" and "Nature Study Lessons on the Mosquito". A paper by Mr. J. Alston Moffat setting forth his reasons for believing that the Archippus butterfly, whose habits he has studied for many years, does not hibernate. Interesting papers on collecting and field work: by Mr. Evans on the attractive powers of an electric lamp; Mr. Winn on his wonderful captures at a clump of milk-weed at dusk; Mr. Walker on "A collecting trip in South-western Ontario," and Mr. Gibson on "A day at the Mer Bleue." Dr. Fyles contributes a paper on "Crickets"; Mr. Stevenson on "Commercial Entomology", and Mr. Williams on "The Food of the Grass Snake," which he finds to be Cut-worms. The volume closes with a report from the North-west (Canada) Entomological Society, by Mr. Gregson; and obituary notices of the late Miss Ormerod and Mr. Otto Lugger, by the Editor.

"The Canadian Entomologist," the monthly magazine of the Society, is now in its 34th year of publication. The volume for 1901 contains 348 pages, and is illustrated with five full page plates and eleven figures from original drawings. The contributors number sixty-two, and represent Canada, the United States, England, Germany, Luxembourg and India. The principal articles may be classified as follows; Descriptions of new genera, species and varieties in Lepidoptera by Messrs. H. H. Lyman, A. G. Weeks, A. Busck and Dr. Wm. Barnes; Orthoptera by Dr. S. H. Scudder, Prof. A. P. Morse and Mr. A. N. Caudell; Hemiptera by Mr. E. D. Ball and Prof. H. Osborn; Diptera by Prof. T. D. A. Cockerell, Messrs. C. Robertson and D. W. Coquillett; Coleoptera by Prof. H. F. Wickham and Mr. H. C. Fall; Hymenoptera by Messrs. E. S. G. Titus, W. H. Ashmead, T. D. A. Cockerell and C. Robertson; Neuroptera by Mr. N. Banks; and Homoptera (Hemiptera) by Messrs. G. B. King and T. D. A. Cockerell. Eleven new genera and sub-genera are described and 123 new species and varieties.

Papers on Classification and Systematic Entomology: Ontario Acrididæ by Mr. F. M. Walker; lists of Lepidoptera from Alberta by Mr. Wolley Dod, from Southern Manitoba by Mr. E. F. Heath; the Moths of Manitoba by Mr. A. W. Hanham and the Butterflies of Nebraska by Mr. M. Cary; Cicadidæ by Dr. A. D. McGillivray; the Genera and species of Coccidæ by Professor Cockerell; the Genus Catocala by Professor G. H. French and Mr. O. C. Poling; Spilosoma congrua by Mr. H. H. Lyman; Generic names in Orthoptera by Mr. J. A. G. Rehn; discussions of Lepidoptera by Dr. H. G. Dyar, Prof. J. B. Smith and Prof. J. R. Grote; Staphylinidæ by Dr. E. Wasmann; Coccidæ by Mr. G. B. King; Collecting Notes on Kansas Coleoptera by Mr. W. Knaus; American Bees by the Rev. T. B. Morice and Professor Cockerell; The Genus Osmia by Mr. E. S. G Titus; the Respiration of Aleurodes by Prof. C. W. Woodworth; the Xiphidiini of the Pacific Coast by Prof. A. P. Morse; Note on Bæus by Mr. W. H. Harrington.

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Life histories of the following insects are given ; Xylina Bethunei by Mr. Lyman ; several species of Hydræcia by Mr. H. Bird : the Green-house Leaf-tyer by Dr. Fletcher and Mr. A. Gibson ; the fall Canker-worm by Mr. D. E. Hinds ; several species of Catocala by Messrs. G. M. and E. A. Dodge ; Nannothemis bella by Mr. R. Weith and Prof. J. G. Needham ; and Arctia virguncula by Mr. Arthur Gibson.

In Economic Entomology there are important papers by Mr. E. D. Sanderson on Plant-lice affecting Peas, Clover and Lettuce ; Diptera bred from Cow mannre by Dr. L. O. Howard ; the Exportation and Importation of Beneficial Insects by Prof. F. M. Webster ; the Insect Fauna of Human Excrement (a review) by Dr. J. Fletcher. Also a paper on the effects of Scorpion venom by Mr. O. W. Barrett.

NOTES ON THE SEASON OF 1902. (WESTERN QUEBEC.)*

By Charles Stevenson, Montreal.

The season commenced early with every prospect of a good time for the Insect-hunter, but the meteorological conditions soon became of such a nature that there was little sport for the Lepidopterist. The temperature was low with high winds and perpetual rains. However, on the 22nd June, when at Piedmont in the Laurentian Hills, I had the pleasure of adding a new species of butterfly to the Quebec list, which was identified by Mr. H. H. Lyman as *Coenonympha inornata* Edw. The day was anything but favorable for collecting, as there was no sunshine and several showers. But on a plateau at a high elevation behind "La Montagne," I caught five perfect specimens in twenty minutes time. On returning to the station I found that Mr. A. E. Norris who had gone off in another direction had caught a weather-beaten specimen. This insect has been recorded in Newfoundland, Labrador, Sault Ste. Marie and Lake Winnipeg in Canada, Montana and Minnesota in the United States. Dr. W. J. Holland, who possesses a large series of this species, says that the Newfoundland type is distinctly darker than those in the Northwest. Four of my captures are pale and one dark. By this capture in the Laurentians it seems probable that its range extends across the continent on the high grounds unfrequented by the Entomologist, and as these regions open up it may prove to be found fairly abundant from Labrador by the Laurentians, along the north shore of the Ottawa on to Lake Winnipeg and into the United States.

At the same place and date while grubbing among rotten stumps I found an interesting looking larva which was successfully reared to maturity, producing a fine specimen of a click-beetle, rare to us, *Pityobius anguinus* Lec. This calls to mind the capture of a very large Eyed-elater, *Alaus oculatus* Linn (Fig. 35) on the slopes of Mount Royal on the somewhat early date of the 18th May, resting on the trunk of a fallen tree.

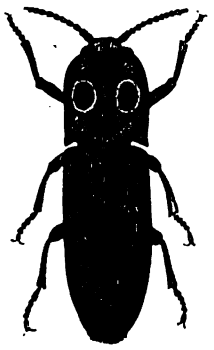


Fig. 35.

When the Natural History Society visited Piedmont on the 7th June, a day of rain and drizzle, a few of us enthusiasts braved the elements and I was fortunate enough to get a syrphid fly new to the very fine collection of Mr. G. Chagnon and a moth *Mamestra latex*, Gn. new to mine.

A specimen of the Hag-moth *Phobetron pithecium* A. & S. was obtained in sweepings on Mont Beloeil at St. Hilaire on the 9th July.

In the Coleoptera my last captures were :

Galerita janus, Fab., 25th May, Rigaud, Que.

Callida punctata, Lec., 9th July, St. Hilaire, Que.

Cychrus viduus, Dej., 11th July, St. Hilaire, Que.

* Read before the Montreal Branch of the Entomological Society of Ontario.

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One specimen was found by Mr. G. Chagnon and two by myself, the reward of an afternoon's scraping among dead leaves and rubbish.

Saperda mutica Say., 19th July, Chambly Co., Que.

Neoclytus erythrocephalus Fab., 11th July, St. Hilaire.

Long-horns were very scarce throughout the season with the exception of *Typocerus velutinus* Oliv., which was quite plentiful.

Platydema ruficorne Sturm, was very abundant in Laval Co. on the 11th May, when Mr. Chagnon and myself obtained over 150 specimens between us in a quarter of an hour.

Two weevils that live on water plants *Lixus rubellus* Rand, and *Lixellus filiformis* Lec., were captured while boating on the lake at Mont Beloeil, St. Hilaire, on the 9th July.

While rearing some *Csmoderma eremicola* larvæ I found that the attractive "Nimble fly," *Zelia vertebrata* Say., is its parasite.

The beautiful Crane-fly *Bittacomorpha clavipes* Fab., was very abundant along the banks of a stream running through the village of St. Hilaire, on the 11th July.

Specimens of the "micropterous" variety of the Chinch-bug *Blissus leucopterus* Say., were found at Rigaud on the 24th May and on Montreal Island during July.

Lepidopterous larvæ were somewhat scarce, especially such ones as the Tent-caterpillars *Clisiocampa americana* Fab., and the Tentless *C. disstria* Hbn. At St. Hilaire the water hemlock borers *Gortyna marginidens*, were plentiful, but those of the burdock *G. rutila*, usually so common on Montreal Island, were fewer than in former years, and Cut-worms have not been prominent. But the Tussock-moth caterpillar is spreading among the shade trees of Montreal to a dangerous extent, and it is to be hoped that the citizens will awaken to the fact, before it is too late.

NOTES ON THE SEASON OF 1902.

By J. Alston Moffat, London, Ont.

To the collector of natural history specimens, the weather is of the first importance; and in no other of the departments of natural history is the collector made to realize the close dependence there exists between the weather and success, than in botany and entomology, whilst entomology seems to be the more sensitive to adverse influences of the two. Hence, a cool, wet summer, although it will produce luxuriant vegetation generally, may, nevertheless, place Paris Green and Bordeaux mixture at a discount.

Perhaps never in the history of his career, has that antiquated subject of reference, "the oldest inhabitant," so completely failed to recall from the dim and distant past, a summer to correspond with that of 1902 in this locality, for uniform coolness and frequent rains, and its natural compensation, a general reduction in the number of insect pests. To the Entomological collector the season may be pronounced a complete failure. During a ramble in quest of specimens, he might see the landscape adorned with flowers, and yet find no butterflies there to give animation to the scene. But as has often been observed amidst a general scarcity, some unusually good finds have been made.

Four years ago Mr. Bice secured a specimen of that rare Sphingid *Deidamia inscripta*, Harr, which he generously donated to the society's collection, the only representative of the species yet there; but early this season he took another in his own house, whilst yet another was taken by Mr. J. Tanton in a different part of the city—a notable incident in so rare a species. Mr. Bice also took a fresh specimen in perfect condition, of that attractive *Sphingid* which is rarely met with here, *Ampelophaga versicolor*, Harr.

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That large and attractive southern butterfly, *Papilio cresphontes*, Cram. Fig. 36, was more frequently seen and larger numbers of it taken than for many years back ; which seems rather strange, considering the character of the season.

That singular looking *Hemipteron Ploiaria brevipennis*, Say. *Emesa longipes*, Fab., whose appearance suggests a componnd between the Mantis and Walking-stick ; has been more fre-

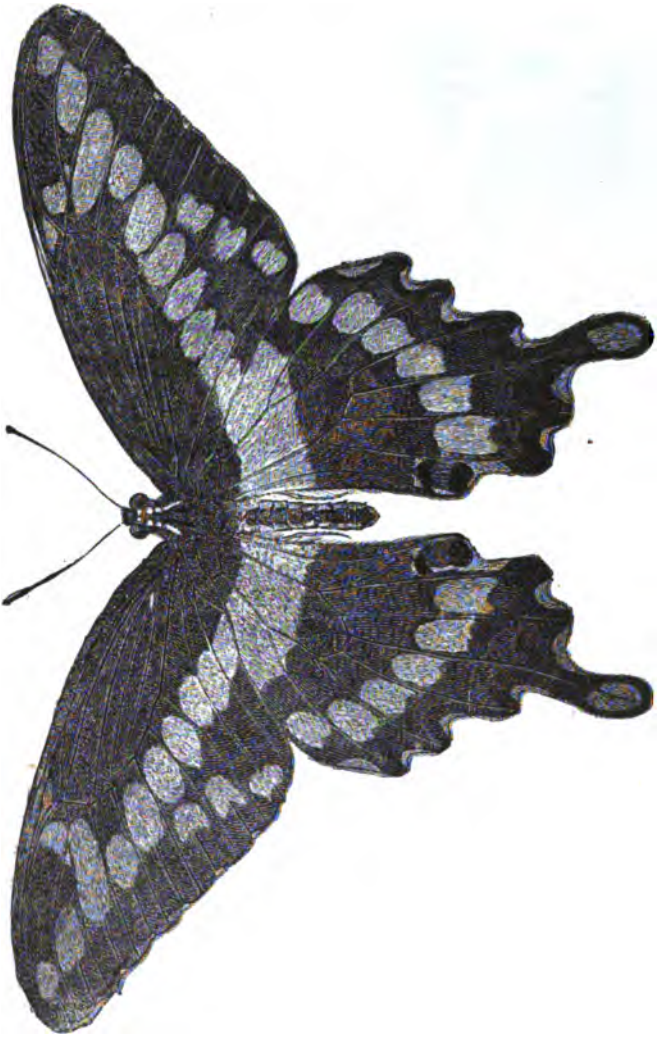


Fig. 36. Papilio cresphontes ; colours, black and yellow.

quently observed, and more interest taken in it, and enquiries made about it than ever before, some fine specimens of it having been brought to me for determination.

As an illustration of the spreading of injurious species, Mr. C. P. Butler of London, Ont., reported his finding in large numbers *Crioceris 12-punctatus*, Linn., on his asparagus the early part of August. This is the first observation of it reported in this locality ; and so far as observation went, it was then confined exclusively to his neighborhood. Mr. Butler kindly provided the society with a liberal supply of specimens for its collection. There are two species of injurious asparagus beetles, *Crioceris asparagi*, Linn,, and *C. 12-punctatus*, Linn., and they differ considerably in their appearance, and to some extent in their habits. *Crioceris asparagi*

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has been on the Canadian list, as having been known to be taken in Canada for fourteen years or more, but it has not yet been reported as having been seen in this city or vicinity, whilst *C. 12-punctatus* will soon prove itself to be the more abundant and destructive species of the two.

Mr. E. M. Walker's observations on the spreading of *Pieris protodice* (Fig. 37) eastward, given in the Thirty-second Annual Report of the Entomological Society of Ontario, page 87, aroused my interest in that butterfly, and I requested the collectors in London to be on the look-out for it; but it was not observed here by any of them. The season was unfavorable for *rapae* (Fig. 23), as it was not nearly so plentiful as in ordinary years, and it may well be regarded as yet more unfavorable for *protodice*, which has been designated "The Southern Cabbage Butterfly." In 1895 *protodice* was reported as plentiful at Windsor, Ont. It was also seen at London where a few specimens of it had been taken the previous year. Since then it has not been observed in London. No further notice of its movements has been taken, so far as I have observed, until Mr. Walker reported it as plentiful at Leamington, Chatham and Sarnia. Which seems to indicate that it is recovering lost ground eastward, but that its appearance at London in 1894 and 1895 should be regarded as a sporadic outbreak, rather than as a permanent advance. The only fresh captured specimen of *protodice* that I have seen this year came from Leamington.



Fig. 37. Pieris protodice; colours, white and black.

Desiring to locate its present boundary eastward, I made a trip to Glencoe. which is about half way between Chatham and London on the Grand Trunk Railway, but found only *rapae* there. So it has not yet got thirty miles east of Chatham; and if it is gradually extending eastward it will be several years yet before it reaches London along that line. But I am under the impression that it will increase more rapidly along Lake Erie shore than it will inland, and my intention was to visit Port Stanley in order to see if it had reached that locality, but a favorable opportunity did not present itself.

If *Pieries protodice* is actually recovering lost ground, how slowly it is spreading eastward as compared with the rapid advance of *P. rapae* westward upon its first introduction into the country. First taken at Quebec city in 1863, and considered likely to have been landed there from Europe three years earlier, it reached Montreal in 1867. Belleville and Trenton in 1872. Port Hope, Toronto and Dundas in 1873. Paris and London in 1875, occuping western Ontario and extending into Michigan in 1876. Thus in thirteen years time it spread from the City of Quebec to the Detroit river. And the marvellous thing about it was that as *rapae* advanced *protodice* disappeared, not leaving a trace of its previous existence in the locality. Now it has taken six years for *protodice* to get from Windsor to Chatham, and then it has not got the whole ground to itself, but only getting to be in the majority. Clearly indicating that *protodice* is meeting with a resistance of some kind to the reoccupying of its lost ground, which *rapae* did not encounter in its progress westward.

This is an occurrence of the most profound interest to every student of biology, and well worthy of their closest attention and consideration. And in it may yet be found a key to the solution of some of the most obscure and difficult problems of the day, in their relation to the science of life in natural history.

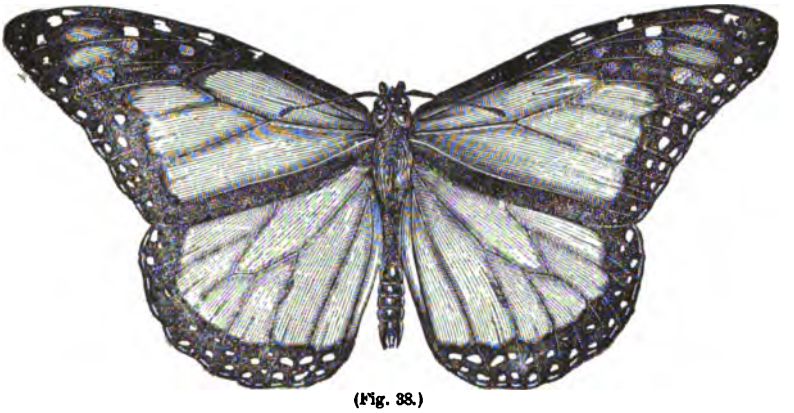
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A FEW NOTES ON DANAIS ARCHIPPUS.

By H. H. Lyman, Montreal.

Were it not for its commonness, I think that this butterfly would be considered, as suggested by the common name proposed by Dr. Scudder, the Monarch of North American butterflies.

It is so large, so strong of wing, and its colours are so rich that its pre-eminence is very marked, and it is so abundant, and so widely distributed that it must be familiar to even the most casual observer of nature. (Fig. 38.)



(Fig. 38.)

As boys, my brothers and I gave it the name of the "Large Striped Butterfly," *Limenitis Disippus* being the "Small Striped Butterfly," and these names had certainly the merit of being descriptive.

But while this butterfly is so common and so easily reared, there is, perhaps, no butterfly about whose life history naturalists have disputed more keenly, and notwithstanding all the arguments and the evidence gathered, the facts have never been made sufficiently clear to preclude further dispute. This shows what a fascinating study is Entomology. There is always something still to be learned about even the commonest species, and everyone, no matter how limited his or her means and time may be, can always add to our knowledge, if only the effort be made in the right way.

The points about which the dispute has chiefly raged are three :

1st. Does it hibernate ?

2nd. How many broods are there ?

3rd. How long do the individuals usually live ?

Mr. Wm. H. Edwards has contended that the life history of this butterfly differs in no essential particulars from that of other hibernating species ; that in Virginia there are four broods, the butterflies of only the last hibernating, and appearing on the wing early the next spring, mentioning the last of March as the time of first appearance, eggs being laid last of April or beginning of May, the 2nd May being mentioned, and the first brood from the hibernators appearing at the end of May.

The late Dr. Riley wrote, "They commence depositing eggs in the latitude of St. Louis during the fore part of May . . . . Butterflies from these eggs begin to appear about the middle of June."

Dr. Scudder claims that in the north (Query : What is "the north" ? and where does it begin in coming up from "the south" ?) the species is only single brooded, that the country is

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annually colonized by immigrants from the south which lay eggs up to the middle of August; that the butterflies never mate the first season; that some attempt hibernation, but that while hibernation may be successful in a few localities in southern New England, usually every hibernator north of the annual isotherm of 40° perishes; that large numbers migrate south, and pass the winter in an active state, that the butterflies live for more than a year, and mingle on the wing with their progeny of the succeeding season, from which it has been suggested that its common name should be "the Tramp" or "the Patriarch."

Mr. Moffat, in the interesting papers which he has contributed to our Annual Reports, accepts Dr. Scudder's theories, and even adds to them. He appears to claim that all butterflies observed ovipositing in the north have come from the "south," but believes that there are several broods in the south, and that each of these broods is controlled by the same strong desire to travel northward, and that there are thus successive waves of immigrants which lay eggs and produce fresh butterflies, and that these successive waves account for the egg layings from "about the first of June and before," till such late layings as produced the butterfly which Mr. Moffat had emerge on the 6th of November, but Mr. Moffat wisely declines to attempt to draw the line between north and south for this butterfly.

There is one point, however, which is not made clear, and that is whether Mr. Moffat believes that the butterflies which emerge in July from eggs laid by the first arrivals in Ontario continue on the wing in the locality where produced, or also emigrate to still more northern latitudes, and if the latter, whether these having come from the "south" mate and oviposit in these more northern regions.

My own experience of this butterfly extends over many years, but I have probably not given it the same careful study that Mr. Moffat and others have done. I have, however, approached the subject with an unprejudiced mind, and have always been open to conviction, but at the same time confess that by natural disposition I am inclined to look with suspicion upon any theory which attributes abnormal causes to observed phenomena.

The facts, so far as I have observed them, are that in the early summer worn and discoloured females appear on the wing, and are seen ovipositing. These worn and discoloured specimens soon disappear, and no such specimens have ever been seen by me after about the middle of July. What becomes of them? Do they die here after laying their eggs, or do they press on to the "north"?

On many occasions I have first seen these immigrants at the end of June or 1st July. At Au Sable Chasm, on 1st July, 1895, I saw the species for the first time that year, and secured two eggs which I saw laid, and a butterfly reared from one of these eggs emerged 31st July. Doubtless they sometimes arrive earlier. Mr. Winn has seen them earlier. I do not remember to have done so in the neighbourhood of Montreal, prior to 1899, and have frequently searched the Milk Weeds in June for eggs or larvæ without success.

Once only I found a larva nearly full grown, on the mountain, which must have come from an egg laid about the middle of June, but in 1899, on the annual excursion of the Natural History Society of Montreal to Montfort, on 10th June, this butterfly was seen flying, and Mr. Norris found an egg and gave it to me. This egg hatched about the 11th, pupation occurred on the 29th, and the butterfly emerged on the 10th July.

On 1st July of that same year, on an outing of the Montreal branch to Chateauguay Basin, I took a pair in coitu. The male was bright, but the female worn and discoloured. I kept them alive in a cage with the food plant, and secured one or two eggs, and a butterfly reared from one of them emerged on the 4th August.

In 1896 I went down to Portland, Me., on 29th August, and during a ramble on the 30th found a larva of the species nearly full grown, which pupated on 7th September. Allowing the usual time for the larval period, the egg could hardly have been laid before the 15th

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August. But what butterfly laid it? Certainly not one of the worn and discoloured spring immigrants. No one, I am sure, ever saw one of them laying eggs as late as the middle of August. What reason is there against supposing that it was laid by a butterfly which emerged about the end of July or beginning of August from an egg laid by an immigrant the last of June or beginning of July?

I accept the colonization theory, but I see no reason to accept the extraordinary hypothesis that this species practises celibacy for a year from its birth.

In regard to the autumnal gatherings, which I regret to say I have never observed, Mr. Moffat's belief seems to require our acceptance of an intelligence scarcely less than human. He speaks of the working of their "minds," claims that a rendezvous is selected, but whether by a representative "committee on place of meeting" duly elected for the purpose, or is named by some Napoleon or Lars Porsena among them, we are not told, and that then messengers are sent forth east and west and north, if not south, to summon the array.

Such a belief is, to me at least, incredible. I have never seen one of these gatherings, but do not doubt that they frequently occur, but I think that if they occurred regularly every year, and that if annual flights to the south were also of yearly occurrence many more observations would have been made and recorded, on account of the size and conspicuous appearance of the species, but I see no reason to attribute anything semi-miraculous to these gatherings.

It is well known that in some years this butterfly occurs in much greater numbers than in others, and it would seem probable that marked swarms only occur in years of great abundance. That a southerly migration also sometimes takes place, may also be conceded but it is not necessary to suppose that scouts are sent out to gather the hosts.

The migration would begin at the furthest point north that the species extended to, and would begin earliest at that point. Naturally, as they flew south they would meet milder climatic conditions, and so be tempted to linger by the way, and to foregather with those inhabitating these regions. That the butterfly has a marked odour is well known, and it seems probable that the odour from these increasing swarms would be carried a considerable distance by the wind, and so tend to attract still more, either from east or west, to these gatherings, of which there are probably not one but many.

Because Dr. Thaxter has observed it wintering, like "the very best society," in the Gulf States, Mr. Moffat concludes that it does not hibernate anywhere, but surely this is too weighty a conclusion to draw from such slender premises.

The life history of this butterfly will never be settled by argument, but the main facts could easily be learned if a sufficient number of intelligent persons would devote a little time to observing the species, and jotting down their observations at the time, as nothing is so unsatisfactory as trusting to one's memory in regard to scientific facts. And to this end I would suggest the issuing by the Society of a leaflet, printed on stout foolscap paper, with one of our Annual Reports, of which a large number are printed and distributed, giving illustrations of the butterfly, caterpillar and chrysalis, and with a series of questions, carefully prepared to elicit information upon all the doubtful points in its life history. That the observers be requested to pin up the leaflet in a convenient place, and fill in their observations as soon as made, and then at the close of the season, when the last of these butterflies have disappeared, to sign and forward them to Dr. Fletcher, to whom they would go post free, and the results could then be tabulated by a committee of the Society.

In order to insure a general interest in the matter, it would be well for the Society, or individual members, to offer a series of say five prizes, ranging from $10.00 to $2.00 for the best and most complete reports sent in.

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THE INSECTS OF THE SEASON.

By W. Lochhead, Ontario Agricultural College, Guelph.

The year 1902 was one of many surprises for the economic entomologist. Several insects which did serious damage in 1901, and which gave indications that their ravages would be even more serious in 1902, were conspicuous by their absence, or by their very diminished numbers. The Hessian Fly is an example. Again, other insects, which in the last few years were not considered serious, appeared in large numbers and did much damage. The Clover-seed Midge is an example. Other examples will be given in their appropriate place in the following notes.

The wet, cold season had its influence in checking the multiplication of some injurious forms, but in the case of others there was no appreciable check.

Insects Injurious to Farm Crops.

For reasons, which can be only partially explained, the Hessian Fly (*Cecidomyia destructor*) did very little damage in those regions where it was most abundant last year. While it is true that a much smaller acreage of wheat was sown last fall, and as a rule the sowing was done much later than usual, yet there remains some apparently unaccountable cause for the almost total absence of flies in those regions. The winter and fall were not unfavorable to insect life, if we can judge from the condition of most insects in spring. It is probable that the parasites were more abundant than were supposed, and that they were instrumental largely in killing most of the Hessian Flies.

In South Grey, however, the Hessian Fly did much damage this year, some fields of wheat being entirely broken down by the spring brood. There it appeared to attack certain varieties of wheat in preference to others. For example, the Early Arcadian was untouched, while the early Clawson, sown at the same time, and on the same kind of soil, and under other similar conditions, was seriously affected.

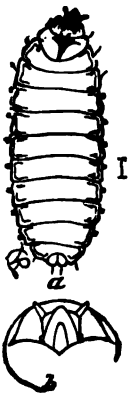


Fig 39.
The Clover-seed Midge: (*a*) larva highly magnified; *b*) head retracted, still more highly magnified. (Riley.)

The Pea-Weevil (*Bruchus pisi*) continued its ravages with undiminished vigour in the older sections, and spread to new areas where it had previously been unknown. It is evident that concerted action must be taken or else pea-growing will have to be abandoned. Already in some sections the latter policy has been adopted.

The Clover-seed Midge (*Cecidomyia leguminicola*) Figs. 39, 40 and 41, was abundant in the western portion of Ontario, and in many places completely destroyed all clover left for seed. Even that which was pastured up to June 20th was destroyed, according to some reports. Here, again, farmers must co-operate. All should cut or pasture their clover until the 20th of June.

In many respects, *Wireworms*, Figs. 42 and 43, may be considered one of the most injurious insects which attack farm crops. The extent of the ravages is difficult to compute, for in some localities they are almost absent, but in others they are very abundant.

On account of their habit of working below the surface of the ground, no reliable method has been devised for their destruction, or for the prevention of their attacks. In fields which have been kept for several years in sod, wireworms are almost certain to multiply. When the sod lands are broken up, the "worms" will be found in almost every stage of development. Some are very young and will require two or more years before becoming mature; some are a year old; some two years old,

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and others nearly mature and perhaps entering the pupa stage. It is evident then that the breaking up of the land will destroy but a small number of all the wireworms in the soil. If the ploughing is done in the fall, and the land is kept well stirred until winter sets in, many pupae will be destroyed; but the grubs will be but slightly injured. The roots of the grasses turned under may satisfy their appetite the following season, and the crops may not suffer much. In the second season, however, these supplies of food are exhausted, and the roots of the growing crops are called into requisition. Hence the common complaint that wireworms are often more destructive the second season after the sod is ploughed under. It behoves the farmer, therefore, to put in a crop which is specially immune, such as peas, or a hoed crop.

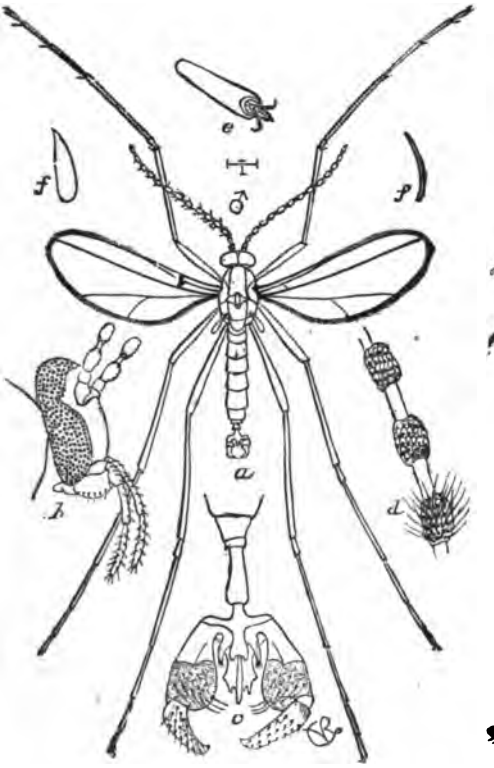


Fig. 40.

(*a*) The Male Midge, highly magnified; (*b*) head, further enlarged; (*c*) clasping organs; (*d*) joints of antennæ; (*e*) claws; (*f f*) forms of scales on body and wings. (Riley.)

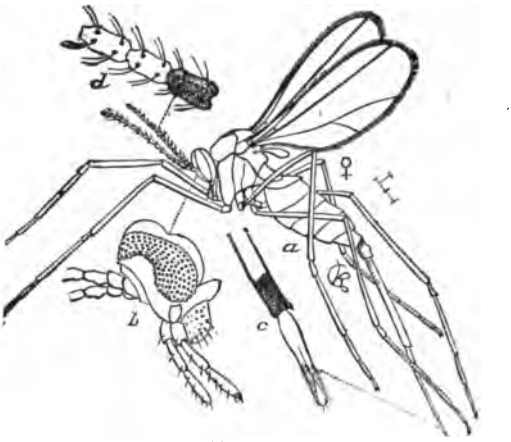


Fig. 41.

(*a*) The Female Midge, with her four-pointed ovipositor extended; (*b*) head; (*c*) tip of ovipositor; (*d*) joints of antennæ; all highly magnified. (Riley.)

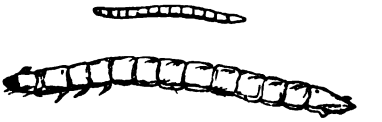


Fig. 42.
Wireworms.



Fig. 43.
Click-beetle parent of Wireworms

The main preventive is a short rotation of crops, in which the fields are not allowed to remain longer than two seasons in grass.

Experiments and experience have both shown that there is no use attempting to kill the wire-worms by soaking the seeds in poisonous chemicals, or by putting poisonous substances on the lands in the hope that the insects will be killed.

Cutworms were quite abundant in many sections of the Province, and did considerable damage.

An interesting observation was made in Kent County where the cutworms were very numerous up to the end of May. Heavy rains occurred at this time, and many of the low, level fields were inundated. Thousands of dead cutworms were seen along the borders of the drowned fields.

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Insects Injurious to Vegetable and Garden Crops.

The Colorado Potato Beetle (Doryphora decem-lineata) was not as injurious as in former years. It is probable that the wet season was responsible for the diminution in numbers.

The Squash Bug (Anasa tristis) Fig. 30, was also not so troublesome as in previous years; but the *Cucumber-Beetles* held their own and did much harm.

Blister Beetles were not so abundant as usual, probably due to the fact that *Grasshoppers* have not been numerous for the past two or three seasons.

Cutworms were reported from North Grey as cutting off young mangolds and cabbages.

The Turnip Aphis (Aphis brassicae) did little damage and was not noted in any reports which I received, but the *Cabbage-worm* (Pieris rapae) was quite destructive not only on turnips but also on cabbages and cauliflowers.

The Zebra Caterpillar (Mamestra picta) was quite common in most turnip and cabbage fields. (See Fig. 21.)

At Leamington in Essex County, the *Melon Plant Louse* (Aphis cucumeris) was very abundant in many of the large melon fields. They were kept in check by a careful application of tobacco solution. These insects are greenish-black, and infest the under surface of the leaves; consequently, the tobacco applications must be made to the under surfaces by means of an elbow on the rod near the nozzle.

Asparagus beetles were not so destructive this year as usual about St. Catharines.

The Tomato and Potato Flea-beetles (Epitrix cucumeris) were very abundant. It is of interest, economically, to note the relation of these flea-beetles to the *Early Potato Blight*, which was prevalent this past season. The edge of the holes eaten by the beetles soon became diseased, and examination showed the presence of spores of the *Early Blight* (Macrosporium solani). It is probable that the beetles are carriers of the disease from one leaf to another, and it is more than probable that the dead tissue surrounding the holes made by the beetles forms a suitable medium for the establishment of this semi-saprophytic fungus.

Early applications of Bordeaux and Paris Green are necessary for the control of the beetles as well as the fungus.

The Potato Stalk-Borer (Trichobaris 3-notata) Fig. 44, which committed such serious ravages in Pelee Island last year, appeared again this year, but in diminished numbers. Many potato-growers on the Island suffered greatly, but definite information as to the real extent of the injury done is wanting on account of the more serious damage done by the *Late Potato Blight* (Phytophthora infestans). The death of the stalk by the fungus may aid in killing the stalk-borer, since the larvæ may be prevented from reaching maturity. It is the duty of the potato-growers, however, to take the usual precautionary measures, viz., to burn the vines in the field in the fall, so as to kill the surviving adult beetles, which would otherwise hibernate in the dead stalks.

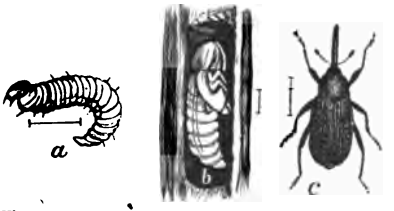


Fig. 44.—Potato Stalk-borer: *a.* grub; *b.* pupa; *c.* beetle, all much magnified.

Insects Injurious to Orchard Trees.

In spite of the unfavorable wet season, the San José scale increased in large numbers in the infested sections. The pernicious nature of the scale is now impressing itself strongly on the minds of the fruit-growers, and they are coming to the conclusion that the warnings of the entomologists, uttered seven or eight years ago, were warnings which should have been heeded then, and not now. The orchard men themselves must now bear the burden of controlling the

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scale. Their task is far from being a hopeless one, however. Experience shows that there are several insecticides which may be used with good results. These are whale-oil soap, crude petroleum, and the lime and sulphur mixture. The last is by far the cheapest remedy, but the great objection to its general adoption is the difficulty of preparation. Two pounds of lime are boiled with one pound of sulphur in a kettle for two hours. Much requires to be known concerning the chemistry of the resulting mixture, for different sulphides of calcium are formed according to the time the mixture is boiled. It is probable that some one of these sulphides is more effective than the others.

The example of Saltfleet Township is to be commended when it passed a by-law whereby inspectors were appointed to make a careful examination of the orchards for San José scale, in view of preventing its spread. It is to be hoped that other municipalities will follow the example set by Saltfleet, so that a limit may be placed to the spread of the scale.

The Codling Moth (*Carpocapsa pomonella*), so far as my own observations extend, was not so injurious this year as last. The first brood appeared rather late, but the second brood was quite numerous. The wet season precluded careful spraying operations which may account for the large second brood.

A correspondent from South Grey reports that the Codling Moth was very injurious. He says: "It would not be exaggerating to say that *one-third* of the apple crop was destroyed by this pest."

In my last year's Notes on the Injurious Insects of the Year, I called attention to the worthlessness of the Haseltine Moth Trap-lantern.

Recently another device for entrapping the Codling worms has been put on the market. It is known as the Expansive Tree Protector. It consists essentially of an expansive metallic collar, coated on its underside with a sticky substance, and a cloth band saturated with a poisonous liquid placed between the collar and the trunk of the tree. Although not in a position personally to test the device this year, I had an opportunity of inspecting many of them in different orchards. In nearly every case they failed to give satisfaction, and in some instances were positively harmful. In the first place, they are difficult to fit to the trunk of the tree; secondly, the sticky substance did not hold the caterpillars, and other forms of insect-life, or prevent them from crawling over it; thirdly, the poisonous band did not kill the insects which crawled beneath the collar; and fourthly, the bark of the tree immediately beneath the band was frequently seriously injured.

In my humble opinion, decided improvements in the construction of this device must be made before it becomes effective.

In Prince Edward County the Apple Maggot (*Trypeta pomonella*) was abundant. In some orchards more than half the fruit was injured by this maggot.

The work of this insect differs from that of the Codling-worm in that channels are eaten through the fruit in every direction. Spraying is of no value in combating this pest, and the remedy is one of prevention. The infested fallen fruit should be destroyed at once, so as to prevent the maturing of the flies. When the maggot is full grown it leaves the apple, and pupates on, or just below the surface of the ground.

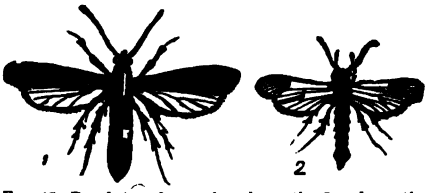


Fig. 45. Peach-tree borer, female moth; 2 male moth.

Peach-tree Borers (*Sannina exitiosa*) Fig. 45, were very numerous, especially in the Niagara district. Many young trees of this year's planting were injured.

The Plum Curculio (*Conotrachelus nenuphar*) was abundant in most sections of the Province.

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The Bud-moth (*Tmetocera ocellana*) Fig. 46, and the Cigar-case Borer (*Coleophora Fletcherella*) were serious pests in many orchards the past season, and it is my opinion that the latter is becoming more injurious with each succeeding year. Last spring I saw an orchard in which every tree was badly infested. In some instances, the wintering cases literally covered portions of some of the smaller branches. It is true that the orchard referred to was a neglected one, so far as insects and fungi are concerned, but it is also true that both the Cigar-case Bearer and the Bud-moth are difficult to treat successfully. Both insects are well protected by their coverings, and experience shows that thoroughly careful spraying at the right time is required to kill them. Fortunately for the orchardist, both begin active work about the same time, hence both can be treated at the same time.



Fig. 46. Bud-moth and larva.

I feel that more demonstration spraying in the infested orchards is necessary before the fruit-growers will be convinced that these insects can be treated successfully. Seven or eight years ago it was shown that two or three applications of Paris green (4 ounces to the barrel) as soon as the cases became active in the spring, would hold the Case-bearers under control. Also, that kerosene emulsion, diluted with nine parts of water, applied at the same time was quite effective.

Aphids were unusually abundant in many orchards.

Insects Injurious to Shade Trees.

The protection of shade trees from the attacks of boring insects is becoming quite a serious problem in many of our towns and cities. It is becoming apparent that greater watchfulness is required. The watchman, however, should have some acquaintance with the habits of the insects to be watched, so that remedies may be taken at the right time. One of the duties of the watchman, however, should be the protection of our insectivorous birds, for we must rely to a great extent upon them for the destruction of the borers. The increase in number of borers in recent years, I think, can be traced to the wanton destruction of so many of our useful birds, and their protection at the present time is imperatively demanded.

A shade tree pest, new to me, has arrived within the last two or three years. The birches are the victims in this instance. I have watched their work in Guelph for two summers. I thought at first that the birches were dying from the physiological causes which produce *Stag-Head*, but I was wrong in my diagnosis. My attention was called this summer to dying birches in Hamilton, where an examination of the dead limbs revealed the presence of a borer. I was unable to get specimens of the adult, but the owner of the trees stated that he saw many of them in early summer. On account of their small size and their active habits, he was unable to make any captures.

From a study of their work, I was able to identify them as the Bronzy-birch Beetle (*Agrilus anxius*), one of the Buprestidae. This borer has been found working in London, Buffalo, Detroit, Ann Arbor and Chicago.

It would appear that the beetles begin work at the top and work downwards. For this reason, the tree begins to die first at the top. The burrows made by the grubs are very irregular, and have no definite direction. In most limbs which I examined I could trace their labyrinthine, net-work courses for considerable distance in the cortex and young wood, but often they would run directly into the wood, and emerge again at the surface. In one case, I found a straight tunnel in the heart-wood, but this occurred in a small twig not more than one-third of an inch in diameter.

The exit hole of the mature beetle is characteristic, I think. One side is straight, and the other is curved to conform to the shape of the beetle.

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The effect of all this burrowing of many grubs in infested trees is to weaken the branches and to interrupt the supply of food and food-materials to the parts above. Some of the trees which were examined in Guelph and Hamilton, had their bark from top to bottom perforated with holes. Many of the larger limbs had raised ridges on the bark, which, when cut open, showed burrows beneath.

The life-history of this insect is about as follows: The adults emerge in May, and begin laying their eggs in crevices on the bark. The larvae hatch in June, and are not full grown when winter sets in. They remain torpid during the winter, and become full grown in April or early May. The pupa stage is of short duration, for the adults begin emerging in May, as already stated.

It is impossible at this stage in the study of the insect to indicate a definite line of remedial treatment. As the beetles are capable of flight, it is necessary that dying and dead trees should be cut down before the escape of the beetles in May to prevent the infection of neighboring healthy birches. Their natural enemies are unknown to me, with the exception of the woodpecker, which I have seen frequently on affected trees. It is likely that we will rely upon this bird to help us in controlling this new pest of the birch.

THE PAPER-MAKING WASPS OF THE PROVINCE OF QUEBEC.

By Rev. Thomas W. Fyles, D.C.L., F.L.S., Levis, Quebec.

Once upon a time, I was taken over a pulp-factory, and shown how billets of wood were converted into paper. The process seemed to me a natural outgrowth from one that I had witnessed, when a boy, among the descendants of Huguenots who settled at Dartford in Kent two hundred years ago. These men, in their little workshops, manufactured paper from cotton rags.

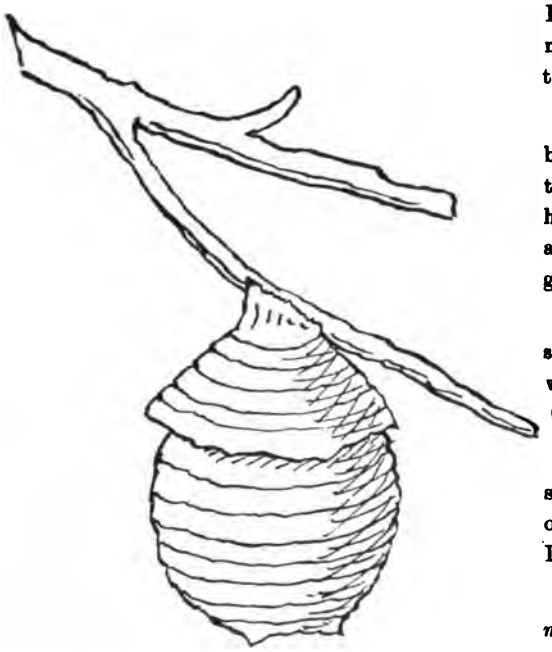


Fig. 47. Wasp's nest at an early stage of construction (original).

The fineness and tenacity of vegetable fibre have been ever since the creation; and paper-makers (not always human) have existed, in successive generations, through all the ages since that great event.

"The thing that hath been is that that shall be, and that which is done is that which shall be done; and there is no new thing under the sun."

"Is there anything whereof it may be said, this is new? It hath been already of old time which was before us."—Ecc. I.. 9-10.

The nest of the Black Hornet (*Vespa maculata*, Fabricius) Figs. 47 and 48, is a wonderful structure, suggestive of a variety of things,—tents, umbrellas, capes, the papier-maché dwellings of the Japanese, compressed woodenware, etc.

It is often of great size. The Rev. J. B. Debbage of Bourg Louis has one that measures round it, over top and bottom three feet two and three-quarter inches and, when taken round the middle, two feet nine and a half inches.

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Our fences and out-buildings supply abundance of material for the busy workers tha construct such dwellings. In the wilderness they resort to trees rent by tempests, etc., for their supplies.

The old church at Hull, Province of Quebec, was built of wood. It had never been painted. One summer day, about thirty-seven years ago, when on a visit to Hull, I walked up to see the church. It stood on a rocky knoll and was surrounded by cedars—the French part of the town now covers the spot.

I thought to look in at the windows, but these were high up; and I did not venture to climb, for busily employed about the building were hundreds of wasps, of different kinds. They were eroding the surface of the wood with their jaws—procuring the materials for the construction of their nests.

The material thus procured would be thoroughly masticated and mixed with a natural fluid or saliva, till it was of the right consistency. The wasps, on commencing their work, would deposit the prepared material and then bring it into shape with their mandibles, going over it again and again, pinching it till it was of a proper thinness.

The comb in the hornet's nest is very different from that in a hive of bees (Fig. 48). The bee's comb is of wax; the hornet's of paper. The bee's comb is suspended in masses perpendicularly — the cells, two deep, being placed back to back and opening sideways. The hornet's comb is suspended in tiers horizontally, the topmost tier hanging by a stalk to the roof, and each of the others by a stalk affixed to the centre of the one above it. The cells are only one deep in each layer, and open below. In the beehive some of the cells are filled with honey and some contain young bees. In the hornet's nest all the comb is brood comb, the young being fed with nutriment prepared by the mandibles and maxillæ of their attendants. (Fig. 49).

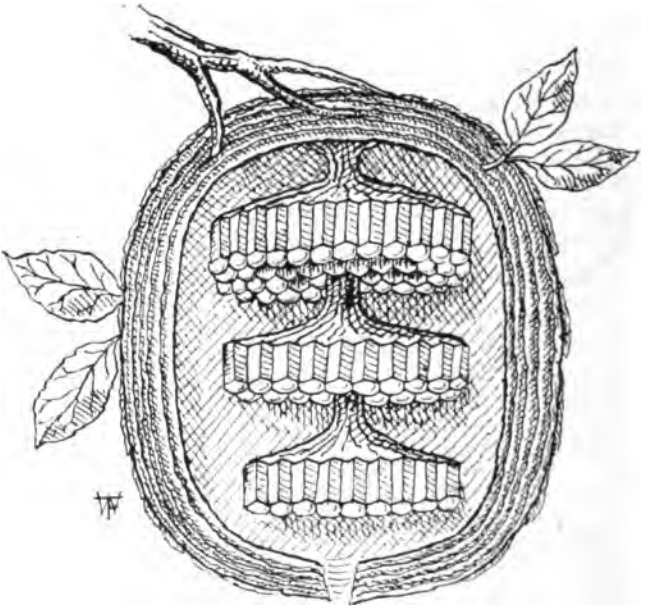


Fig. 48. Section of Hornet's nest (original).

The larvæ of the hornet, in their early days, are held in place by a glutinous fluid, and later, by pressure upon the sides of their cells. When they are about to change to pupæ, they spin a web over the entrance of their cells and close themselves in.



Fig. 49. Head of Wasp, showing mouth parts (original).

Mr S. Stone, in the *Entomologist's Weekly Intelligencer* for June 11th, 1859, (No. 141, page 84) thus described the process of feeding the larvæ in a wasp's nest:

"The process is an extremely interesting one. An attendant or nurse on retiring from a foraging excursion with a caterpillar it has found on a neighbouring hedge; a piece of meat neatly rolled

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up, that it had purloined from a butcher's shop or somebody's larder; a specimen of the insect popularly known as 'daddy-long-legs,' shorn of its wings and other encumbrances, especially if the day be a windy one, for the purpose of lessening the difficulty of conveying such an unwieldly creature through a disturbed atmosphere—for wasps have powers as nearly as possible allied to reasoning ones, as has been observed upon other occasions as well as the one recorded above; or perchance a winged ant caught in the act of migration, is met at the entrance to the nest by one, two, and sometimes three other attendants. These at once lend their aid in cutting up the 'prey,' which they not only reduce to the consistency of pulp by mastication, but to all appearance actually swallow. Having done this they separate, and taking different courses, commence feeding the larvæ which lie in their route. As they pass over a cell, the larva therein contained, if hungry, protrudes its head and applies its mouth to that of the attendant, who stops for a few seconds for the purpose of allowing it to sip its fill. This done, the latter moves on to another cell, where the process is repeated. If on the approach of the attendant a larva does not require food, instead of protruding its head it remains quiet, when the former passes on to another cell where its services may be required. In this way an attendant will feed perhaps twenty larvæ before the contents of its stomach, or whatever else may have served as a receptacle for the food it has been dispensing, is exhausted, when it again proceeds in quest of food, either leaving the nest to obtain it, or else taking part, in the manner already described, with one which has just returned from foraging."

It will be observed from the above account that the wasps feed their charges much as the dove feeds her young, by supplying them with partly digested food from its own crop.

Mr. Stone's observations upon the feeding of the wasp-larvæ confirm those made by Mr. Spence as recorded in Letter XI, *Kirby and Spence's Entomology*, and by Willoughby and Réaumur before him.

Vespa Germanica, Fabricius—like the European *Vespa vulgaris*, Linneus—makes its nest in a chamber in the ground, taking advantage of some natural hollow, or enlarging the run of some small animal. I found such a nest by the roadside on the Island of Orleans last summer.

Some years ago I took a nest of *Vespa media*, Olivier. I found it suspended from the ceiling of a coach-house belonging to my highly-esteemed friend, the late I. J. Gibb, Esq., of Como, P. Que. This nest was compact and smooth, and of the size of a cricket-ball. The entrance was in the middle of the under side, and was about half-an-inch in diameter.

The late P. H. Gosse in the *Canadian Naturalist*, page 269 describes the nest of *Vespa marginata*, Kirby. He says:—

"That is not a stone, although it looks so much like one, as you would find to your cost if you planted your foot on it. The mowers have cut as near as they durst approach to it, for it is a wasp's nest (*Vespa marginata*) and full of very irascible and formidable subjects, who are not to be assaulted with impunity. These large round nests are generally attached to a stone, often nearly covering it, and cannot easily be distinguished from it. They are made of a tough whitish paper, manufactured by the wasp, of the minute particles which she abrades from weather-beaten wood, and agglutinates with saliva, spread out into this form. This nest consists of several layers, convex above, and projecting at the edges to shoot off the rain from the comb within, which is made of the same substance, and contains young and pupæ. You may observe numbers of the wasps coming and going, and crawling busily about the nest, the entrance to which is beneath the edge."

Vespa marginata, Kirby = *Vespa consobrina*, Saussure = *Vespa arenaria*, Fabricius. See Cresson's HYMENOPTERA, page 290.

I found a nest of this species last season in the open woods near Fort Number 2, Levis. It was close to the ground, and was supported by some small stems of brush wood. I went one cold day in October to obtain it, but somebody had forestalled me.

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Among the bees there are large females, small females or workers, and males or drones; so is it among the wasps; and the male wasps are stingless as the drones are. They may be distinguished from the females in this way :—

The male wasps have 13 joints in the antennæ.

The female wasps have only 12.

The male wasps have 7 abdominal segments.

The female wasps have only 6.

Bees, wasps and ants have the three kinds,—males, females and workers. It is customary amongst naturalists to distinguish these by the astronomical signs for Mars, Venus and Mercury. The sign of Mars is a shield and spear ♂. That of Venus is an apple with its stalk ♀ —in reference to the golden apple awarded to her, as the most beautiful of the three goddesses (Juno, Minerva and Venus), by Paris. That of Mercury, the *caduceus*, or staff with serpents intertwined ☿.

Hornets and wasps are not troublesome unless they are molested. They destroy vast numbers of flies and destructive larvæ, spiders, etc. But, strange to say, the wasps themselves fall victims to predacious flies (Asilidæ) which know how to pounce down upon them, and seize them, just so that they can neither use their jaws nor their stings.

The following is a table of the Quebec Paper-making Wasps :—

Family VESPIDÆ.

Genus *Vespa*, Linneus.

1. The Black Hornet, *Vespa maculata*, Fabricius.
2. The Margined Wasp, *Vespa arenaria*, Fabricius.
3. The German Wasp, *Vespa Germanica*, Fabricius.
4. The Diabolic Wasp, *Vespa diabolica*, Saussure.
5. Fernald's Wasp, *Vespa Fernaldi*, Lewis.
6. The Scalloped Wasp, *Vespa media*, Olivier.
7. The Red Wasp, *Vespa rufa*, Linneus.
8. The Common Wasp, *Vespa communis*, Saussure.
9. The Northern Wasp, *Vespa borealis*, Kirby.

Genus *Polistes*, Latreille.

1. The White-footed Polistes, *Polistes pallipes*, Lepell.

NOTES.



Fig. 50.—Vespa Maculata, the Black Hornet.

1. The Black Hornet (Fig. 50), is so named to distinguish it from the Yellow Hornet of Europe (*Vespa crabro*, Linneus). It is the largest and most formidable of our wasps. It is common and well-known.

2. *Vespa arenaria*, is known to the French Canadians by the term "Guêpe cousine." It is a handsome black wasp with narrow, white or yellow margins to the abdominal segments.

3. *Vespa Germanica* is a beautiful little wasp, and has much yellow about it. It may be easily recognized by the yellow bands on the first segment of the abdomen which form a loop, and enclose a triangular patch of black.

4. The female of the Diabolic Wasp is about six-tenths of an inch long. It is black with long yellow hairs. It has much yellow on the abdomen. Upon the first segment, the yellow

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is narrow and interrupted. Upon the others, it is indented by the black, in the middle, and on either side of the indentation is a black dot. Saussure must surely have been severely stung by this wasp when he gave it its formidable name.

5. *Vespa Fernaldi* was identified for me in the Entomological Division of the Department of Agriculture, Washington. It is a pretty insect. In each of the abdominal segments the black intrudes upon the yellow by three indentations, of which the apical one is the largest.

6. In *Vespa media* all the segments of the abdomen are marked alike with three scallops protruding from the black band of every segment. The workers especially of this species have much brown hair about them.

7. *Vespa rufa.* Last summer I took a perfect female specimen of this beautiful and rare wasp. It was flying under the veranda of Mr. Morgan's country-house on the Island of Orleans. The insect is three-quarters of an inch long, and an inch and a quarter in expanse of wings. The antennæ was black without spots. The eyes are black and have an outer streak of white on the upper off side only. Between the antennæ is a white patch, indented above and below, and broader than deep. The white facial plate is angulated outwardly, and is divided, through all its length, by a broad black patch somewhat narrowed towards the bottom. The legs of the insect are pale yellow above and red underneath. The marks on the thorax are white. The segments of the abdomen are bordered with creamy white. The wings are somewhat smoky, but have an ochreous tinge, and the veins are sienna-coloured. The first abdominal segment of this wasp is of a rich chestnut or venetian red; and on the second segment there is an interrupted patch on either side of the same colour. This segment is, with the exception of the border, wholly dark red on the under side. The tip of the last segment is red. The wasp is strikingly handsome. In the Provancher collection there is a worker of this species taken at Chicoutimi.

8. *Vespa communis* also was identified for me at Washington. It, more than any other of our Quebec wasps, resembles the *Vespa vulgaris* of Europe. I have taken it at Cowansville and at Quebec.

9. *Vespa borealis.* The wasp is described in Kirby's "Fauna Boreali-Americana: Insecta" page 265. The description may be found on page 129 of Dr. Bethune's useful compilation from Kirby's work, which was published by the Entomological Society of Ontario some years ago. Kirby states that the specimen he described was taken as far north as lat. 65°. A male specimen of this species that I took at Levis last summer has been identified for me by Mr. Ashmead of Washington.



Fig. 51.—Polistes pallipes; *a.* the wasp; *b.* portion of comb.

Polistes pallipes may be easily known from its slender and elegant form, its soft brown colouring, its white feet, and the two parallel longitudinal streaks on the after part of its thorax. (Fig. 51.)

I will now close my paper with a story told me by Mr. H. Brainerd of Montreal. It tells of an entirely effective, but *somewhat costly* method of getting rid of a wasp's nest.

The Hamilton Powder Company had a magazine at Dinorwic, Ontario. In it was stored four tons of dynamite. One day in last September two Irishmen were sent by the Hudson Bay Company, to take out a supply of the explosive. There was a wasps' nest under the eaves of the building, and an irritated wasp stung one of the men. He "got mad," and vowed he would "smoke the critters out," so he made a "smudge." Now the ground had become saturated with nitro-glycerine, and no sooner was a light applied to the smudge, than an

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ominous flash alarmed the men, and they took to their heels. They had gone but a short distance when there was a fearful explosion and they were struck down senseless. On their recovery they told how the affair had happened.

The loss was—the building ; the dynamite, worth about $1,200 ; charges for broken glass, $140 ; and a smashed canoe ; *but no trace of the wasps' nest could be found.*

SOME INTERESTING HABITS OF LEPIDOPTEROUS LARVÆ.

By Arthur Gibson, Ottawa.*

The student of insects is continually being astonished and mystified by the wonderful things which are ever occurring in the entomological division of the animal kingdom. No matter what kind of insect study one may enter upon, nature never fails to present a varied, at times incomprehensible, series of interesting objects. In the lepidoptera there is no exception to the rule. While mysteries will continue to be, at the same time, owing to the rapidity with which the science is now developing, many of the facts which are, as yet, unexplainable, will doubtless in the near future be expounded, and knowledge which we are now badly in need of, be duly placed at our disposal. A study of the larvæ of our butterflies and moths will soon convince the student that there is much of interest as regards even the habits of the commonest species, many of which show remarkable traits.

As the title given this paper covers a wide field it is only the writer's intention to mention, in a general way, some of the interesting habits which have come under his notice. When asked for a short paper it occurred to me that if I could put together a few facts concerning the habits of some of these larvæ, my endeavor might not be without interest.

At the outset a short mention will be made of the feeding habits of these creatures. All have doubtless seen some caterpillars feeding, and know that the particular habits of each kind vary to a great extent, almost every species showing some peculiarity. While some caterpillars are extremely restricted in their choice of food, only feeding on one or two plants, others are quite indifferent and will eat almost anything, some species having been known to eat up everything in sight. A good common example of the former class is the Monarch Butterfly, *Danais archippus*, Fab., the larvæ of which are known to feed only on *Asclepias*, while in illustration of those which are general feeders, the Variegated Cutworm, *Peridroma saucia*, Hbn., might be cited. During July and August, 1900, the caterpillars of this species fairly swarmed in the Province of British Columbia and the States of Oregon and Washington, devouring plants of all kinds and causing a loss to grown crops of $168,000 in British Columbia alone, from which it has been estimated that a loss of $2,500,000 accrued in that year in the United States and Canada.

From an economic point of view an understanding of the feeding habits of larvæ is important. It is well known that if the grower of any marketable crop desires to obtain the fullest returns, a knowledge of his insect enemies will materially aid him, when his fruit trees, cereals, etc., are attacked by any of these pests. While some caterpillars are general feeders, most species, however, are particular in their choice of food In the event of a certain caterpillar occurring in large numbers upon any single kind of fruit tree, or crop, anxiety or loss and unnecessary work may be prevented if it be known to the producer that the species only feeds on the plants upon which it is first found, or those botanically related, and that it is not likely to spread to adjoining crops. Of course there are instances of certain caterpillars doing damage to plants upon which they were not previously known to feed, but such occurrences are unusual. Cutworms, for instance, which are the caterpillars of the Agrotid moths, as a

* Read before the Toronto Branch of the Entomological Society of Ontario.

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rule only feed at night, generally confining their attacks to low plants, such as cabbages, cauliflowers, etc., so during serious outbreaks apprehension as to danger to near-by trees, or other crops, may, in many instances, be avoided.

Some species of larvæ have the habit of lying close together in serried ranks when feeding, and many of congregating when resting. Interesting examples of the former kind are *Procris Americana*, Harris, Fig. 52, *Attacus promethea*, Dru., and *Hyperchiria io*, Fab., which, when in their younger stages, feed in a row, each larva beside the other, on the underside of a leaf. *Vanessa antiopa*, Linn., and the *Datanas* are examples of those which feed in colonies, a small branch having as many as fifty or more, close together, while on the remainder of the tree there may not be a single specimen. The two kinds of Tent Caterpillars furnish splendid examples of larvæ which congregate in masses when not feeding. Everyone has seen the tents of *Clisiocampa Americana*, Harr., the true tent caterpillar, containing large numbers of the larvæ, and most people have doubtless seen the large masses of the Forest Tent caterpillar, *Clisiocampa disstria*, Hbn., which does not make a tent, the larvæ when at rest congregating on a silken mat spun on the trunk of a tree or along one or two of the branches.



Fig. 52. Procris Americana larvæ feeding.

While many species of caterpillars have the habit of congregating in numbers, others are quite the opposite, and are solitary throughout the whole of their larval existence, not more than one, or at most two, specimens being found feeding on a single plant. A common interesting illustration of this is *Arzama obliquata*, G. & R. The larva of this species is a borer, feeding inside the main stem of the common Cat-tail, *Typha latifolia*, L., inside of which it also generally passes the pupal state. Specimens, however, when mature sometimes leave the Cat-tail and wander, or swim, to the shore or edge of the swamp to seek a suitable place to pupate,—under a rock, piece of fallen branch, or in an old stump under the bark or in the rotten wood. I have collected hundreds of specimens of this caterpillar in various localities and only rarely have found two specimens in the same plant. These larvæ when full grown measure nearly two and one-half inches long, and not possessing any attractive qualifications can hardly be termed beautiful caterpillars. Mr. Henry Bird, who has done such good work in *Hydroecia*, relates the interesting habit of *Hydroecia duovata*, one of his new species. In a letter to Dr. Fletcher he says that "thousands of plants (*Solidago sempervirens*, L.) may be examined without any sign of a borer. A dozen isolated ones in another neglected spot may contain twenty-four larvæ, not twenty-three, or twenty-five, but the two dozen to a nicety, for Mrs. Duovata can count up to two without any failure when depositing her ova." Among the butterfly larvæ those of *Pamphila metacomet*, Harr., and some other skippers, which Dr. Fletcher has specially studied, are solitary in habit. These caterpillars feed on various species of *Carex* and curiously enough furnish themselves with a cocoon-like structure, in which they live when not feeding. This interesting contrivance is placed between two of the larger leaves which are drawn together and fastened by means of silk. This habit of course provides great protection to the caterpillar, as it is only by separating almost everyone of the central leaves of a plant that their home can be found. It is altogether unlikely that many have seen these caterpillars in nature, as they require to be looked for very closely.

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During the past two summers the foliage of birch trees of all kinds, was badly attacked by the larvæ of *Bucculatrix Canadensisella*, Cham. These small caterpillars occurred in vast numbers throughout Ontario, but were not noticed by the public until late in August when the trees assumed a seared appearance, and the leaves were dropping prematurely. These larvæ are popularly known as the Birch Skeletonizer, from the way they eat away the cellular tissue of the foliage, leaving only the fibrous skeleton, and are of considerable interest from the peculiar habit they have, which is quite unusual, of spinning on the leaves, before full grown, flat circular shelters, called pseudo-cocoons, whenever they are ready to moult. These little shelters, which of course are only large enough to contain the one larva, are only used by the caterpillars about a day or so before the process of casting their skin.

An interesting example of a caterpillar illustrating protective mimicry was observed last season by Dr. Fletcher and the writer. In May, 1901, larvæ of one of the noctuid moths, *Homohadena badistriga*, Grt., were found in some numbers on the yellow-flowered honeysuckle, *Lonicera hirsuta*, Eaton. Caterpillars in all stages were found, but strange to say no trace of eggs could be seen. Very small larvæ were collected about a quarter of an inch long, which must have been out of the egg only a day or so. Doubtless, as is often the case, the young caterpillar made its first meal of the shell from which it had emerged. It is probable that some eggs were still on the plant, but although searched for diligently, none could be discovered. When young the caterpillars feed on the foliage of the new shoots of the plant and generally hide inside the two clasping leaves which surround the cluster of flower buds at the tip. When mature they crawl down to the shady side of the old wood of the plant, upon which they rest when not feeding. At this time the general colour of the caterpillar is remarkably like that of the stem, or twig, upon which it is resting, and owing to this striking resemblance, it is thus protected from numerous enemies.

Many other larvæ owing to their colour being similar to that of the plant upon which they feed are likewise hidden from view, and unless searched for carefully, even when they are known to be present, are difficult to find. *Plusia æreoides*, Grt., which feeds on *Solidago Canadensis*, L., is another example of a corresponding similarity in coloration of the caterpillar to the green colour of the leaves and stem, protecting the species from natural enemies, such as birds, parasites, etc.

The larva of *Nerice bidentata*, Walk., feeds on the foliage of elm ; it is a rather curious caterpillar with sharp protuberances down the dorsum. This species feeds on the edge of a leaf, and owing to its colour being the same as that of the foliage, and its peculiar elevations on the dorsum corresponding with the outline of the leaf, it is thus protected considerably from being observed. A similar example of protective resemblance is found in the caterpillar of *Telea polyphemus*, Cram., which when feeding on the edge of an elm leaf from which it has eaten out a portion, is even better protected than the above by reason of its indented dorsal outline and the bright lateral stripes, which simulate the ribs of the leaf.

An interesting habit which certain of the Coliad larvæ have, is that of resting exactly in the same place, after feeding, along the mid rib of a leaf. When wandering off to feed they spin a path of fine silk as they walk. After they have eaten their meal they are thus able to return by following this silken road to the exact spot from which they first started. *Papilio turnus*, Linn., also has the habit of spinning a platform of silk across the upper side of a leaf upon which it rests when not feeding. (Fig. 53).

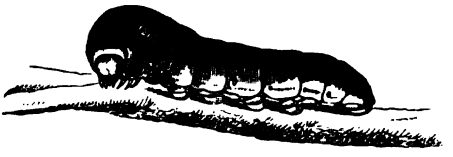


Fig. 53. Larva of Papilio turnus.

Doubtless every collector of insects, or student of natural history, has noticed the habit which many caterpillars have of drawing two or more leaves together by means of threads of

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silk, in which they feed, or in which they rest when not feeding. Some larvae curl up a single leaf, fastening the sides with silk, and live inside the enclosure thus made until they have eaten nearly the whole leaf, when they go to another leaf, and so on until they reach maturity. The caterpillars of some of our common butterflies, such as *Vanessa Milbertii*, Gdt., *Pyrameis cardui*, Linn., etc., have this habit. The larvæ of the large skipper *Eudamus tityrus*, Fabr., which feed on the Locust-tree, *Robinia Pseudacacia*, L., and *Nisoniades lucilius*, Lint., on Aquilegias also live inside tents, which they make by drawing down a leaf to serve as a cover fastening the same to another leaf immediately under. One end of the leafy case is left open to enable the caterpillar to get out to feed.

Phlyctaenia ferrugalis, Hbn., which is an interesting species on account of its economic importance, has been called the Greenhouse Leaf-tyer, from the habit of the larvæ of drawing the leaves together, and tying them with silk. When this caterpillar is at rest it has the habit of curling round to the side of the body the head and first three, or four, segments. Many of the larvæ of the smaller species of moths fold, or roll over the edge of a leaf and seal down the whole of the turned edge with threads of silk. These small caterpillars live through all their larval stages inside the same enclosure, in which they also change to the chrysalis state. Everyone must have noticed the work of the common Basswood Leaf-roller, *Pantographa limata*, G. & R. This larva cuts a leaf half way across the middle, and then rolls the end portion into a tube, within which it lives.

Some caterpillars when at rest assume curious positions. Many geometrid larvæ have the habit of extending the whole body straight out into the air, the anal prolegs and feet firmly clutching the twig, or leaf, upon which they happen to be. They often remain in this position for a considerable length of time, without even slightly moving the body. In numerous instances the colour of the caterpillar, and the object upon which it is resting, is almost, if not quite the same, and the larva may appear as an additional twig, the casual observer being unable to differentiate between the living caterpillar and the object upon which it rests. The

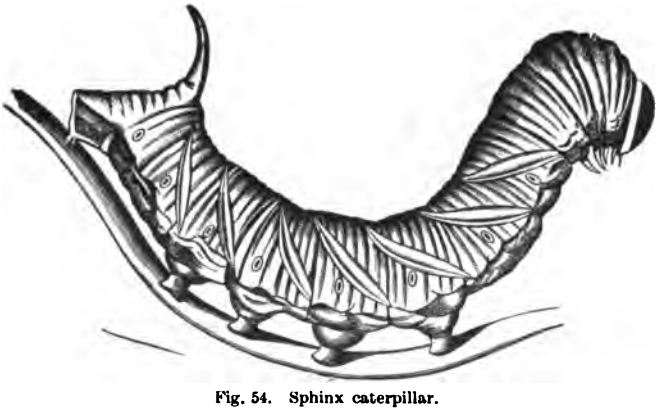


Fig. 54. Sphinx caterpillar.

larvæ of the Sphingidæ, or Hawk-moths, when resting have the habit of rearing the front of the body into the air, curling the head and first segment, down in a most stately manner (Fig. 54). They have been known to remain in this position perfectly motionless for hours. On account of this habit they are when thus resting supposed to resemble the Egyptian Sphinx, and owing to this resemblance the name Sphinx, and the family Sphingidæ is due.

The fruit of the raspberry is occasionally injured to some extent by the larvæ of the Raspberry Geometer, *Synchlora rubivora*, Riley, Fig. 55. This caterpillar is furnished on each segment with several short bristles, or spines, and has the habit of disguising itself, by at

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taching to these spines, very small bits of vegetable matter, such as the anthers of flowers, tiny pieces of leaves, etc. Owing to this habit it usually escapes detection. The curious larva of *Harrisimemna trisignata*, Walk, attaches pieces of its cast skin etc. to some long hairs on the front segments. When at rest the thoracic feet are drawn up close to the body and the front segments raised, giving it a very uncaterpillar-like appearance.

Although presenting sometimes a rather formidable appearance, with the exception of one or two kinds which are provided with irritating hairs, caterpillars are quite harmless. Some of the Sphingidæ will jerk their heads from side to side and even snap their mandibles, but they are unable to bite anything thicker than

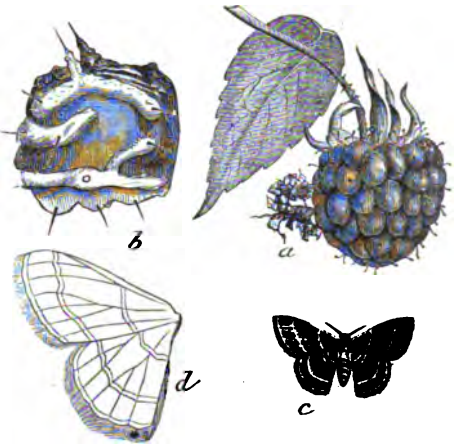


Fig. 55. Raspberry Geometer: *a* larva, natural size, on fruit; *b* segment, magnified, shewing hairs, etc.; *c* moth natural size; *d* pair of wings enlarged—colour pale green.



Fig. 56. Hyperchiria Io, caterpillar.

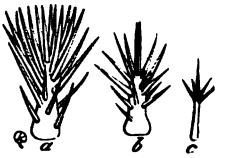


Fig. 57. Spines of Io, caterpillar, magnified

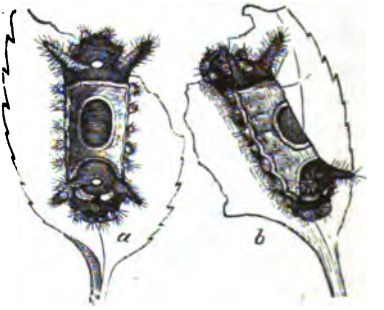


Fig. 58. Empretia stimulea caterpillars.

the edge of a leaf. The best known stinging larvæ are the pretty caterpillars of *Hyperchiria Io*, Fabr., (Fig. 56,) every point of whose mosslike covering is a poisoned dart, (Fig. 57,). Several of the slug caterpillars, as *Empretia stimulea*, Clem, are also able to leave unpleasant reminders when handled, (Fig. 58.) The hairs of the larvæ of the Brown-tailed moth *Euproctis chrysorrhea*, Linn, are likewise excessively irritating to the skin.

In conclusion the writer can only express the hope that this limited mention of some of these interesting habits may not be without some result, and that those who have never had the pleasure of watching the many habits of lepidopterous larvæ, may be led sometimes to take an interest in these creatures—the larval state of our butterflies and moths. Every species of caterpillar is worthy of study, and as so little is known of the preparatory stages of most of the lepidoptera, particularly of the moths, there is in this branch of study alone, a vast field for research. Many points doubtless of much value, even with regard to some of our common species which as larvæ, devastate our forest trees, fruit trees, and all kinds of crops, are yet to be discovered. Every little helps, and facts which may be considered worthless at the time often prove later on to be of great scientific value.

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NOTES ON SEMIOPHORA YOUNGII, SMITH.

By Arthur Gibson, Ottawa.

In the report of the Dominion Entomologist for 1901, on page 251, mention is made of a new enemy to tamarac, or the American Larch (*Larix Americana*, Mx.) and the Black Spruce, (*Picea nigra*, Poir.), viz., *Semiophora Youngii*, Smith. This insect occurred in sufficient numbers in a large peat swamp near Ottawa to cause considerable destruction. A notice of this is also made in an account of "A Day at the Mer Bleue, Eastman's Springs, Ont." by the writer. (Rep. Ent. Soc. Ont. 1901.) During the past season further observations were made on the life-history of the species, but our knowledge of the habits of the insect is still far from complete.

On the 21st May, 1902, a trip was made to the Mer Bleue, by Mr. Young and the writer, but only a few larvæ, from half to three-quarters grown, could be found, and these were very local. At this point, owing to recent fires, the only trees on the swamp are small tamaracs and spruces from two to four feet high, and what larvæ we did find were all hiding in the wet moss at the base of the tamarac trees, a few inches below the surface. No specimens could be found near the spruce trees. A great many trees in other parts of the swamp were examined, but in only the one spot could specimens be found. In every case it was necessary to search in the moss at the base of the tree to find the larvæ as no noticeable injury to the foliage could be detected. The mature caterpillar is a handsome creature "about an inch and a half in length when full grown, of a rich velvety brown, with a ruddy or greenish tinge in different specimens, the dorsal area showing the richest colours, and bounded on each side by the white clear and threadlike lateral stripes; the dorsal stripe of the same intensity as the lateral stripes; the spiracles black and lying on the upper edge of a broad white substigmatal band, the lower surface much paler than the dorsal, the whole body finely mottled with small purplish brown spots. The centre of each segment on the dorsum is darker and more velvety than the intersegmental folds. The head is reddish brown finely mottled with lighter spots." (Fletcher.)

On the 18th September another visit was made to the locality in the hope of collecting some of the imagoes. At this time the moths of the Cranberry Looper, *Caterva catenaria*, Cram., were in great evidence—hundreds and hundreds of specimens in perfect condition. At almost every step four or five of these moths would arise from their resting places, and flutter away. Unfortunately, however, we were too late to secure good examples of the moths of *Semiophora Youngii*, Smith, but in all five specimens were taken, three by Mr. Young and two by the writer. These five specimens were in poor condition and were all collected at rest on small tamarac trees. Mr. Young put one of his specimens, a female, into a chip box, and secured some eggs, half of which he gave to the Division of Entomology. These were laid on the 19th Sept. and the young larvæ hatched out of doors on the 28th and 29th Sept. The following brief description was taken of Stage I—Head, brown. Body cylindrical, semi-translucent, pale greenish after feeding. Thoracic shield concolorous with head. Tubercles black and shiny. No markings on the body. The young larvæ loop when walking.

On the 16th Oct., in company with Dr. Fletcher and Mr. W. S. Odell, an enthusiastic microscopist, another trip was made to the Mer Bleue, and on this occasion two pupæ, of what we take to be *Semiophora Youngii*, Smith, were found by the writer, in the moss at the base of a small tree. One of these was dead, but the other contained a living, rather large hymenopterous parasite, almost fully formed, which could be distinctly seen moving inside. This pupa has been kept in a warm office ever since, but the parasite has not as yet emerged (1st Dec.) although still active inside the pupa.*

* Since the above was written the parasite has emerged, and Mr. Harrington tells me that it is a species of *Anomalon*, ot previously taken here and unknown to him.

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The same day Dr. Fletcher collected a small noctuid larva about half an inch in length in the wet moss at the base of a small tamarac tree. This looks very much like the caterpillar of *Semiophora Youngii*, Smith. It is still alive and is hibernating out of doors.

INSECTS INJURIOUS TO ONTARIO CROPS IN 1902.

By Dr. James Fletcher, Dominion Entomologist.

The season of 1902 has been a rather unusual one in all parts of Canada. Exceptional rain fall has been recorded during the summer at almost all localities, and this has had a perceptible effect upon the abundance, or the reverse, of many of the well-known pests of the farm and garden, as well as upon the development of some of the staple crops. Late spring frosts were answerable for a considerable injury to grape and other fruit crops, including an affection of the leaves of apple trees generally referred to by correspondents under the term "yellowing of apple leaves," and also probably for a curious premature ripening of potatoes, which could not be referred to any of the known fungous diseases.

Cereal Crops.

In the Province of Ontario cereal crops were little injured by insects, the chief damage complained of being due to heavy rains. Rust was prevalent in many places, and complaints of lodging on account of heavy straw were frequent. Peas, which once formed such an important crop in Ontario, were little sown this season, owing particularly to the depredations of the Pea Weevil. The Pea Moth was less destructive than usual, and the Destructive Pea Aphis was only mentioned from a few localities, upon late peas and the grass pea. The grass pea, *Lathyrus sativus*, L., a pea-like plant belonging to the bean family, is not a true pea, but the seed resembles peas so much that it was hoped that, as this plant is entirely free from the attacks of the Pea Weevil, it might prove a valuable substitute for peas in those districts where the Pea Weevil is destructive. These hopes, however, during the past season have been disappointed, probably on account of the season; the grass pea, being of tropical origin, seems to require more heat than we have had during the summer of 1902. The seeds ripened unevenly, and the plants continued growing and flowering right up to frost. Late in the season in some places it was attacked by the Pea Aphis. However, in some seasons during the many years it has been grown, it has been known to give excellent crops, of from 10 to 30 bushels to the acre, of excellent peas, which can be used for most of the same purposes as real peas. Field peas, where sown late, were injured by mildew, and in the southern counties were seriously affected by the Pea Weevil. Beans were much injured by the weather. Late frosts in spring and heavy rains made re-planting necessary in a great many places. Fodder crops with the exception of corn, yielded heavily, but wet weather at haying time made it sometimes difficult to save the crop. There was a general complaint that clover did not form seed, even where there was no midge. Wheat and oats, our most important cereal crops, were of good quality and yielded heavily. A most satisfactory and unexpected condition prevailed throughout the whole province, as far as the Hessian Fly is concerned. This is largely due to farmers having followed the advice given by specialists as to the best means of avoiding injury from the attacks of this insect. Most farmers speak of its absence as "a most remarkable disappearance." The only serious injury by the Hessian Fly recorded in Canada this year was in Manitoba, where, however, as only spring grain is sown and as there is there only one brood of the insect in the year, as far as we know, the Hessian Fly can be kept in check with comparative ease. Grasshoppers were troublesome in some parts of western Ontario, where they also occurred last year. They appeared again in destructive numbers in Manitoba, but wherever

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the Criddle mixture was applied, most satisfactory results followed. It will be well for farmers, should grasshoppers appear in Ontario again next year, to give this mixture a trial. It is a great improvement on the well-known poisoned bran mash, which has been so widely used against cutworms and also to a less extent against grasshoppers. Mr. N. Criddle, of Aweme, Man., noticed that grasshoppers were very much attracted to fresh horse droppings, and he at once tried substituting that material, which is always obtainable on farms without cost, for the, in Manitoba, very expensive bran. The results were so satisfactory that many of the farmers in his district used the mixture during the past summer and saved their crop. This mixture consists of one pound of Paris green mixed with sixty pounds of fresh horse droppings. To this is added two pounds of salt, and the mixture is then scattered broadcast around the edges of the fields by means of a trowel or wooden paddle. It is probable that even a weaker mixture than the above will prove effective.

The pea crop as stated above was a small one in Ontario this year. Few field peas were planted and these only in northern counties. This is due almost entirely to the prevalence of the Pea Weevil, more generally known as the "Pea Bug," which is by far the worst enemy of this important crop. It is indeed at the present time one of the most destructive enemies of farm crops, demanding the urgent attention of farmers in Canada and the United States. The pea crop is one of very great importance, and there is no other which quite takes its place for feeding. The loss is now enormous, probably nearly one million dollars a year in Ontario alone, and yet there is a simple and effective remedy, which is well known and may be said to be perfectly satisfactory in every way, as it is effective, easy of application and of comparatively small cost. A great effort is now being made to stir up public opinion in this matter and get some definite concerted action taken during the present winter and next year, so as to induce pea growers to follow the advice which has been so often given. It does not seem unreasonable to hope, in view of the peculiar circumstances of this case, that in one year a perceptible change might be made in the amount of infested and injured peas on the market, and, with this insect, more perhaps than with any other, total extermination seems a possibility if all will work together; but united action would have to be taken in all parts of Ontario and the northern United States where seed peas are grown. Many farmers have already given up growing peas, and others are talking of doing the same. The facts of this infestation and the problem which they involve, are simpler than is ordinarily the case with a pest of equal magnitude. The Pea Weevil, as a regular crop pest, only occurs in Canada in certain counties of Ontario, and there are still many places in the north where good peas can be grown free of this pest. The counties worst affected are those lying just north of Lakes Ontario and Erie. It is an exotic insect and has no native food plant, its only known food being the cultivated pea, which is also an exotic and will not winter over in this country. Every pea, therefore, which is sown in spring, has passed through the hands of seedsmen and others, and thus it has been possible at some time to treat this seed before it is sown. A remedy which is perfectly effective and easy of application by everyone with ordinary care, is to fumigate the seed before sowing with bisulphide of carbon. The large seed merchants, for this purpose have special buildings called "bug-houses" and practise this remedy regularly, finding it quite satisfactory; and, were it not for farmers and gardeners who grow a few peas for their own use and will not adopt the proper means of destroying the weevils before sowing their seed, there would be little difficulty in quickly bringing down the numbers of this destructive enemy. Now, however, some seedsmen who formerly fumigated their seed regularly, are omitting to do so, claiming that their efforts are useless all the time there are so many who do nothing. Although treated seeds may contain no weevils, yet in an infested district a crop grown from clean seed may still become infested by weevils which will fly in from the surrounding district, where seeds containing living weevils had been sown, or from insects which emerged the previous autumn.

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The full grown Pea Weevil, is a small, roundish, very active beetle about one-sixth of an inch in length, greyish brown in colour and bearing two conspicuous black spots at the end of the abdomen above. (See figure). These beetles lay their eggs on the green pods; from these, small white grubs hatch, which bore in and attack the nearest seed inside the pod. They penetrate by a minute hole which is afterwards almost obliterated by the growth of the increasing seed. There is only a single insect inside each seed, and it remains there until fully developed.



This takes place perhaps, as an average date, by the middle of August, and, as a rule, most of the weevils remain in the seeds till the following spring. However, and this is one of the greatest difficulties in getting a perfect remedy for the Pea Weevil, some of the beetles, in certain seasons a large proportion of them, leave the peas in autumn and pass the winter about barns, buildings, etc. This makes it necessary to reap and thresh as soon as possible, so that the seed may be treated before the weevils leave it. Some of the best seed dealers have for years been urging upon growers the importance of this and have sent out printed circulars to their customers, offering a higher price for seeds delivered by a certain date, so that the injury may be as little as possible; the grain, being harvested before it is dead ripe, is also of better quality and germinates better. Efforts will be made during the coming winter to have this matter fully discussed at all the farmer's meetings in the Province. I am convinced that this problem of stamping out the Pea Weevil entirely, is a matter of possibility if farmers and seed merchants will only work together for a short time and carry out the instructions given. The Pea Crop of Canada is far too important for farmers to give up growing it, nor do I think that this would be a wise course to adopt, until a much greater effort has been made to get farmers to use the common sense plan which has proved so successful with those who have tried it. An old and well-tried remedy is to hold over seed peas till the second year before sowing. The beetles will emerge the first spring and will die inside the bags. Another good plan is to treat the seed with coal oil 1 gallon to 20 bushels of seed, turning the seed thoroughly with a shovel every day for 4 or 5 days.

Root Crops.

There has been a noticeable absence of some of the destructive enemies of root crops. The Turnip Aphis has hardly appeared. The Cabbage Butterfly, which last year was so injurious to cabbages, turnips and rape, has been very much reduced in numbers by bacterial and insect parasites. The Colorado Potato Beetle was troublesome where neglected, but is easily kept in check with the ordinary poison applications. The advisability of applying Paris green or some other poison in Bordeaux mixture has been demonstrated this year, when the Potato Rot has very much reduced crops which were not protected by this useful remedy. The Bordeaux mixture, consisting (for potatoes) of 6 lbs. of copper sulphate, 4 lbs. of fresh lime and 40 gallons of water, as a remedy for this terribly widespread and destructive disease, is one of the greatest triumphs of modern applied science. It always pays to apply it to growing potatoes to protect them against various fungous enemies, and it has been found that the ordinary poisons which destroy insects may be applied mixed with the Bordeaux mixture, without lessening the effect of either. The Gray Blister-beetle, *Macrobasis unicolor*, Kirby, was reported from a few places, but no serious injury was done, and it must be remembered that the occurrence of these beetles in large numbers indicates that many locusts have been, or will be, destroyed, because the larvæ of the blister-beetles feed entirely upon the eggs of grasshoppers. Asparagus Beetles occurred in numbers in the Niagara Peninsula, and have spread somewhat during the past year. The remedies most relied on are dusting larvæ freely with freshly slaked lime, collecting the beetles in beating nets and applying poisoned sprays to the food plant.

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As a consequence of the wet season, Slugs have been more abundant than usual, and several complaints have been received of their injuries to root crops and various garden plants. These molluscs are seldom troublesome, except in damp places or in wet seasons. The best remedy is to dust plants lightly for three or four consecutive evenings, just at dew fall, with freshly slaked lime, which adheres to the viscid coating of the slugs, and causes them great discomfort, as is shown by the copious out-pouring of the slimy secretion. After two or three applications the animal loses the power of producing slime and dies. The lime has no injurious effect on plants and indeed is beneficial on many lands. When these creatures, as is sometimes the case, give trouble in greenhouses, lime or salt may be dusted between the flower pots on the benches ; a good bait which attracts slugs and snails very much, is bran damped sufficiently to make it adhere. A very small quantity of Paris green may be added to this and will soon clear out the marauders. In greenhouses the poisoned bran or oat-meal may be placed on slips of glass, which can be put out at night and removed during the day.

Fruit Crops.

The fruit crops of the province have been on the whole satisfactory, although irregular. In some places heavy yields were secured, but in others there was a shortage. The ordinary insect enemies have been less abundant than for many years, but fungous diseases, particularly the Black Spot of the Apple, have caused loss in most districts, and in a few places the Sooty fungus, *Labrella pomi*, has appeared. This produces on some varieties, particularly Rhode Island Greenings, an unsightly appearance which is known in the trade under the name of "Clouded Fruit." There has been a remarkable absence of injury from the Codling Moth, Cankerworms and Tent Caterpillars. Plums are reported as a light yield, owing to late spring frosts and excessive rain. Where spraying has been neglected, great injury has been done by the Plum Curculio and the Plum Rot has been more prevalent than for many years. This fungus every year destroys enormous numbers of peaches and plums, and the dried mummified fruit may frequently be seen in orchards otherwise well cared for. It is a most important part of the remedy for this disease, to gather, from the ground when they fall and from the trees after they have dried up, the diseased fruits, because in these is found the most fertile source of infestation of the crop of the following year. All should be burnt before the spring opens, and the trees should be sprayed carefully just after blossoming with poisoned Bordeaux mixture, which will have the double effect of checking the fungus and preventing injury by the Plum Curculio. The absence of so many of the regular enemies of the orchard must be due in a large measure to the season, but also certainly to the increasingly large number of fruit growers who now carry on their work in a scientific practical manner, spraying thoroughly and using the remedies which experience has shown are the proper ones for the different pests. The word "spraying", however, to many who endeavor to practise this operation, has still little more meaning than doing something, in any sort of a way, to fruit trees with a spraying pump. It cannot be too often insisted upon, that spraying is the operation of applying by means of a force pump and spraying nozzle a special liquid mixture, which varies according to the habits of the insect to be treated, with such force as to break up the liquid so thoroughly that it falls upon the plants treated as an actual mist or spray. Such terms as "sprinkling" and "showering" are inaccurate for the operation intended. Undoubtedly, much of the so-called spraying, as usually done, would be more accurately designated by these terms which describe a much less careful and less even distribution of liquids. The Eye-spotted Bud-moth has been rather troublesome in apple and plum orchards, particularly in the eastern counties and down through the Maritime Provinces.

The subject of the injurious Scale Insects of the orchard, to which so much attention has been directed of recent years, owing to the unfortunate introduction into our province of the San José scale, has done much to show the value of a practical knowledge of Entomology.

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This has been brought prominently before the fruit growers of Canada by means of the magnificent work which has been carried on by the Honourable John Dryden, Minister of Agriculture for Ontario, through two members of the Council of our Society, Mr. Geo. E. Fisher and Prof. Lochhead, whose efforts have been well seconded by the nurserymen of the province, who have been most assiduous in conforming to all requirements which the Minister thought it wise to impose. As a consequence of this, the condition of orchards, as far as other scale insects and various other pests are concerned, is actually better than it was before the advent of the San José scale. The standard remedies for scale insects, kerosene emulsion and whale-oil soap solution, are now pretty well known and generally adopted. The Oyster-shell Bark-louse, next to the San José scale, is the one which does most harm. Where this occurs upon trees in the San José scale district, it is, of course, destroyed at the same time as that scale, when trees are treated with the drastic measures which have been found necessary. When trees are found to be infested by the Oyster-shell Bark-louse (Fig. 59), the proper steps to take are to spray the trees early in the winter with a simple whitewash containing one pound of fresh lime in every gallon of water. Two applications should be made, the second wash may be applied as soon as the first is dry. In spring invigorate the trees by spudding in a light application of well rotted manure around the roots, and during the summer spray the trees, at the time the young scale insects hatch, with kerosene emulsion or a whale-oil soap solution. For the San José scale the latest results obtained by Mr. Fisher have proved that this insect can be controlled by spraying infested trees early in spring with the California Lime-Sulphur and Salt wash, which Mr. Fisher has modified—he thinks, with equally good results—by omitting the salt. This treatment must be followed during the summer by spraying with kerosene emulsion. I have visited Mr. Fisher's experimental orchards several times and have seen the excellent results which he has secured; these are certainly a monument not only to his great perservence but to the foresight of the Provincial Minister of Agriculture, under whose instigation the many and various experiments carried out by Mr. Fisher were made.



Fig. 59.—Oyster-shell bark louse on a twig.

In some orchards at Queenston and Niagara there are some interesting occurrences of the Plum Gall-mite, *Cecidoptes pruni*, Am., which are now receiving experimental treatment. The small round galls are clustered around the twigs and increase in numbers very rapidly. The injury to the tree is not very apparent at first, but ultimately the twigs are destroyed. The extremely small mites live in large numbers inside the galls, which are only one-sixteenth of an inch in diameter. There is apparently no opening to them except just at the time the mites emerge. Applications sprayed over the trees have so far proved unsatisfactory. Mr. Fisher has tried fumigating with hydrocyanic acid gas, and, although at first this was apparently successful, many of the mites certainly being killed, later examinations have shown that it is not a satisfactory remedy.

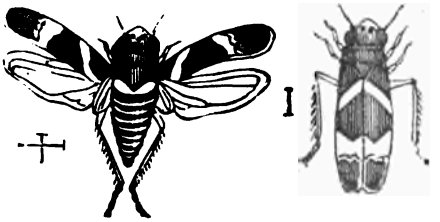


Fig. 60.—Grape-vine Leaf-hopper, much magnified.

The Grape-vine Leaf-hopper (Fig. 60), has done considerable harm in some vineyards in the neighborhood of St. Catharines, and experiments have been carried on with a view of getting a practical remedy for these troublesome insects, well known among growers as "the thrip." The most serious injuries by this leaf-hopper are its attacks upon the Virginian Creeper, where used upon houses and arbours.

The Apple Aphis has been rather more destructive than usual, and it has been found necessary towards the end of the season to advise the spraying of trees, when it was very

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abundant. This is seldom the case in Ontario, although a regular thing in British Columbia, where it is very destructive every year. Apples were seen during the past summer in Prince Edward Island, which were seriously injured by this insect; where the fruit was punctured, deep pits were left, giving the fruit a distorted and gnarled appearance, which rendered it quite unsaleable. This injury probably took place when the apples were very small. The Cherry Aphis appeared in very large numbers early in the season in western Ontario; but later there was little sign of the insect upon the trees, and its injuries were hardly noticed. It is significant that just before the disappearance of these plant-lice one of the severe frosts, already referred to, occurred, and it seems possible that this may have been answerable for the disappearance of the plant-lice. It was not, however, the only cause, for a week later many of the insects were found in some orchards in the same localities.



Fig. 61.—Pear-tree Slug; *a*, magnified.

The Pear Slug, *Eriocampa cerasi*, Peck (Fig. 61), was abundant in some places and did a great deal of harm by destroying the foliage of plum, cherry and pear trees. This pest seems to be very generally ignored by fruit growers and, as a consequence, it often levies heavy tribute. The autumn brood, skeletonizing the leaves, prevents them from performing their functions and thus the crop of the following year suffers.

White Grubs (*Lachnosterna*) were complained of as troublesome in strawberry beds, as well as in potato fields and pastures. There is no good practical remedy for these insects when occurring on farm crops. Where land can be ploughed up, this should be done in August, so as to disturb the pupæ which in many species form at this time, and are very tender. The life history, as generally accepted, is that the eggs are laid in June and the young larvæ feed until August of the following year, when they pupate and assume the perfect form. The beetles, however, do not then emerge but remain in their earthen cells until the following May. When strawberry beds are attacked, undoubtedly the best remedy, which, I think, was first suggested by Mr. P. C. Dempsey, of Trenton, is to adopt the one crop method; this consists simply of planting out the new strawberry sets in spring or the previous August, and then taking the crop the next spring. As soon as such runners as are required for propagation are secured, the beds should be plowed up. White Grubs are most destructive in old beds, and, by adopting this method which also, horticulturists claim, gives the most paying crops, the insects are prevented from making headway.



Fig. 62.—White-Grub fungus.

Two interesting occurrences of the fungous parasite, *Cordycepe melolonthæ* (Fig. 62), came to my notice during the past season, one at Ottawa, reported by Mrs. Brown and Miss Lees, the other at Renfrew, by Mr. W. J. Kerr. These outbreaks of this beneficial fungus, although occurring rarely, as a rule, reduce the numbers of the white grubs rapidly and perceptibly where they occur.

Two comparatively new fruit pests which require attention from fruit growers, are the Blackberry Soft-scale (*Lecanium Fitchi*), which has appeared in destructive numbers upon cultivated blackberries in western and central counties, and the Rose Scale (*Diaspis rosæ*), which attacks the rose and the blackberry. In the latter case, it frequently occurs with the Blackberry Soft-scale. This latter has a conspicuous dark

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brown polished scale about $\frac{1}{8}$ inch in diameter, hemispherial in shape, and is frequently so thickly clustered on the canes as to cover portions of them entirely. Like many other scale insects, it increases most rapidly on old or worn out plantations, and is very much attacked by both fungous and insect parasites.

The Rose Scale is much smaller and flatter. The color is clear white, and the females are circular in outline, while the males are elongated. When abundant, they give the infested plants the appearance of having been finely spattered with lime. The remedy for both of these insects is to plant new plantations from healthy beds, or to prune severely and spray early in spring with kerosene emulsion or whale-oil soap solution.

A possible enemy of the apple may be mentioned, although as yet little is known of its injuries. Last autumn I found at Ottawa three small green larvæ of a saw-fly, in cells eaten about half an inch deep into the sides of apples. The walls of the cavities were white and dry, and the orifice was closed with debris gnawed from the apple, but there was no appearance of excrement in the cavity. The mouths of the orifices, however, were hardened and of a greenish hue as though they had been made before growth had ceased. These larvæ produced last spring the common Saw-fly (*Taxonus nigrisoma* Nort). It seems probable to me that the larvæ may merely have gnawed holes into the apples as presenting a convenient place for pupation; but, as the three larvæ were in different apples from distant parts of the orchard, and all found by chance, it is just possible that they may have been abundant, and that we may have in future to deal with a new enemy of the apple. In England there is a saw-fly which causes considerable loss in the apple crop. These Canadian larvæ resemble very closely a species which is frequently abundant on docks, and some species of Polygonum riddling the leaves in autumn. I regret to say I took merely a superficial description of the larvæ before they pupated. I shall be glad to hear if anyone else has noticed this attack.

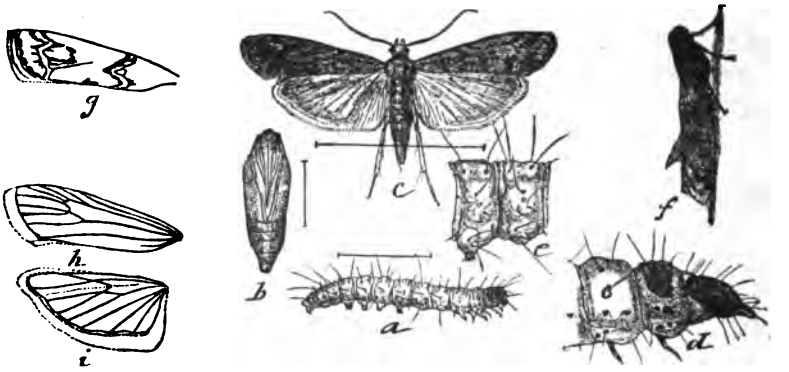


Fig. 63.—The Mediterranean Flour Moth.

The Mediterranean Flour Moth (Fig 63). An insect which has spread rapidly through Canada of late years, but of which little is said, is the above named which is a serious pest of many of our Canadian and American flour mills. Far greater care than has been practised in the past will have to be exercised by millers in keeping their premises clean and constantly swept out, before this pest is controlled. Millers, however, now understand the habits of this insect and the best means of checking its increase. In my own experience, thorough fumigation with sulphur has given the best results, accompanied with constant cleaning up, and in winter throwing open the mills to the full intensity of the winter weather. This, if, as some claim, it does not kill the larvæ, at any rate prevents them from developing so quickly, and probably from breeding for long periods. Two different parasites have been bred by me in large numbers during the two past years from infested mills. One of these, from Rockland, Ont., has been named *Idechthis ephestiæ* by Mr. W. H. Ashmead, the other is probably an undescribed species, and was received from Moulinette, Ont., where it occurred in such numbers as to attract the attention of the men in the mill and obtain a popular name, "the red-tailed fly."

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The Buffalo Carpet Beetle (see Fig 31) has spread largely during the past summer, and now occurs as a household pest not only in western Ontario, but as far east as Ottawa. In the Province of Quebec it is found in the eastern townships, and in Nova Scotia there is another colony in the Annapolis valley. Housekeepers should use every effort on its first appearance to clear this destructive insect out of their houses. Carpets should be taken up and beaten thoroughly out of doors, the floors mopped with scalding water, and, before replacing the carpets, strips of tarred paper should be placed round the edges of rooms. All cracks in the floors after brushing out thoroughly should be sprayed or sprinkled with gasoline. Anyone suffering from the presence of this pest will do well to look up the articles which have appeared upon this subject in our reports, or I shall be pleased to give full particulars as to treatment to anyone who will apply to me on this subject, or concerning any other injurious insects.

An allied insect *Attagenus pellio* has also been reared from larvæ which were destroying carpets at Wolfville, N.S., and which were kindly forwarded to me by Mrs. M. G. DeWolfe.

ENTOMOLOGICAL RECORD, 1902.

By Dr. James Fletcher, Ottawa.

Since the appearance of the Entomological Record of 1901, many letters have been received, not only from Canadian students, but also from specialists in the United States, testifying to its value for the purposes for which it was prepared, viz. (1) to give the names and addresses of Canadian workers in the various orders of insects and of specialists who will help others working at the same subjects; (2) to record species not previously published as occurring in Canada; (3) to give exact data as to the distribution of species, together with dates when certain insects have been captured, so that places may be visited and desirable species sought for at the time and place where they are known to have occurred; (4) to draw attention to works of particular value in the different departments of Entomology; and (5) to place on record anything which it is thought will affect the progress of the study of the insects of the Dominion.

A great many notes of captures have been received, and, from these, selections have been made for mention of such species as, in the opinion of the writer, seemed worthy of recording. Great care has been exercised in endeavoring to arrive at correct determinations, and some species which have been reported have been for the present omitted until further light has been received

One gratifying feature has been very marked, viz. the encouragement which has been afforded to beginners and collectors living in isolated or distant localities, from bringing them into correspondence with specialists elsewhere, concerning interesting species which they have been fortunate enough to take. As a consequence, a considerable amount of exchanging has been arranged during the past year, which has been mutually advantageous to those concerned. Some species which were generally thought to be exceedingly rare, have proved, by references in last year's Entomological Record, to be merely species with restricted localities, which may occur in some abundance in those localities, easily obtained by those living there and supplying them with a valuable means of obtaining from others many species to them more desirable in exchange. I find from my correspondents that there has been a most gratifying increase in their correspondence concerning Canadian insects. In this way, many students who would never have known of each other's existence, have been brought together, and there has been a consequent increase in the knowledge of Canadian insects and their distribution. Some have expressed their appreciation of the fact that they now feel that they can do effective work as factors in one large system with a definite end in view. This feeling has induced a few to ask

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advice as to the choice of some special line of investigation, which would be of particular use to the science of Entomology in Canada. I believe that in 1903 more special work will be done in the Dominion than has ever been done before. As in the past, invaluable assistance has been rendered to Canadian collectors by experts in the United States and Canada. As much of the initial correspondence has passed through my hands, I must particularly express gratitude to Dr. L. O. Howard, Dr. Harrison G. Dyar, Mr. D. W. Coquillett, and Mr. W. H. Ashmead, of Washington; Dr. J. B. Smith, of New Brunswick, N. J.; Dr. H. Skinner, of Philadelphia; Dr. Wm. Barnes, of Decatur, Ill., who spent some weeks in British Columbia and visited Alberta last summer, when he called on several of our Western members thus encouraging and assisting them very much by identifying many species seen in their collections; Mr. E. P. Van Duzee, of Buffalo; Mr. H. Bird, of Rye, N.Y.; Prof. H. F. Wickham, of Iowa City, Iowa; and Mr. W. H. Harrington, of Ottawa, all of whom have been most kind and patient in identifying species whenever submitted to them. I am pleased that, in almost all instances, Canadian collectors have gladly given specimens to these specialists upon a suggestion that they would be acceptable. When an expert authority who has gained his knowledge after many years of close study, takes the trouble to go through a large number of specimens and name them, sometimes at the expenditure of much time, the least that can be done is to make a great effort and considerable sacrifice to provide him with any specimens which he may indicate as desirable. I presume here also to remind my readers that they should be very careful to remember that return postage has to be paid by these gentlemen, but that they will very seldom mention this. The amount of postage on parcels returned may be seen by examining the postage stamps on the wrappers, and this or its equivalent should be scrupulously returned. Specimens of undescribed species, even when uniques, are useless in a private cabinet, and, when these are described by a specialist, he should at any rate have the privilege of retaining them. Such specimens when deposited in the collection of a recognized authority, are where they may be of benefit to a very large number of working entomologists, but when hidden away in a private collection they are practically useless. This should indicate the very great importance of entomologists depositing in National Museums, or in the cabinets of Societies, like our own, where there is a regular curator, specimens of great rarity, or such as are of particular interest, not only for the reason that they may be of use to the greatest number possible but also to preserve them from destruction more effectually than is possible in any private collection. When a new species is submitted for description, as full a series as possible, and of specimens in the best condition obtainable, should always be sent. Unfortunately, it is too common a practice to send a poor specimen for identification. This is largely done of course to avoid the danger of destruction in the mails; but, if specimens are firmly pinned, supported where necessary with cotton wool, and carefully packed with plenty of soft material between the box containing the specimens and the outside wrapper or box, they may now be sent with comparative safety. In the case of lepidoptera specially prized, specimens should be relaxed, taken from their pins, and put in papers for transmission by mail.

During the past year I have learnt of several more naturalists in different parts of Canada, who are working at various orders of insects. Some of these are connected with the public schools of the country, in which Nature Study has recently been recognized as an important part of education. In British Columbia the British Columbian Entomological Society, with its headquarters at Vancouver, and with a most energetic secretary in the person of Mr. R. V. Harvey, and the Rev. G. W. Taylor as President, has done excellent work during the past year in working up the insect fauna of the province. The Society has already issued three lists containing the names of such species of lepidoptera as have been identified, and similar lists of the other orders are to appear. Quarterly meetings are held for the exhibition of specimens at various centres, and a monthly serial in manuscript is circulated, giving the experiences

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of the different members for the previous month. Notes upon captures, upon insects identified, and on methods and arrangement of collections, on the rearing of larvæ. etc., are added by each member upon blank sheets, and the number is then passed on to the next in order. The North-west Entomological Society, which owed its existence to the enthusiasm of Mr. Percy B. Gregson, of Blackfalds, Alta., has done such good work that it drew sufficient attention to itself for a public meeting to be called in Calgary, where its scope was extended and the name of the Society changed to the Territorial Natural History Society, with the following objects:—To instruct farmers as to the nature of beneficial and injurious insects, weeds and birds, and to establish natural history museums at central points in connection with schools, etc. Arrangements have already been made to establish museums of natural history at Blackfalds, Lacombe, Calgary and Regina. The last of these will be in the care of Mr. T. N. Willing, the Territorial Government Weed Inspector, who is a keen observer and enthusiastic naturalist. Mr. Willing is also the secretary of the new Society.

Literature.

Bibliographical notes on entomology have appeared regularly as usual in entomological journals and scientific magazines, and a Bibliography of Canadian Entomology is prepared annually for the Royal Society of Canada by Dr. C. J. S. Bethune, and appears in its transactions. The Canadian Entomologist (London, Ont.), Le Naturaliste Canadien, and the Ottawa Naturalist are indispensible to the working entomologist. The same also must be said of the American Naturalist, Entomological News, Psyche, Journal of the New York Entomological Society, Transactions of the Amer. Ent'l. Soc'y. and Science. In these publications every book of importance is noticed, and there is no necessity here to make particular mention of many works of a general nature which have appeared during the past year.

I would, however, direct attention to "Caterpillars and their Moths" by Miss I. M. Eliot and Miss Caroline G. Soule. This is a charming book, written in an attractive style, which illustrates on every page the great fascination there is in rearing insects from the egg and also how important discoveries may be made by close observers, even in the case of well known insects. The clear descriptions of methods, and hints on breeding, will be found very helpful, even to many who have had considerable experience in this work.

"The Common Spiders of the United States," by J. H. Emerton. This makes accessible a new field of study in a subject of great interest to everyone. The book is well illustrated and each of the 200 or more species is figured and described in simple language. It is a welcome addition to our literature.

"The Book of Bugs," by Harvey Sutherland. Notwithstanding the title, which will perhaps deter some from examining it, this book, which is written in a novel, racy style, will induce all who open it to read on and on to the end, and in doing so they will obtain many useful and accurate facts concerning several common insects and some bugs. It will also probably commend itself to a class of readers who will be benefited by the information given and who might not be reached by the ordinary works on entomology.

Specialists.

It is to be hoped that now this record provides a means of bringing collectors in all parts of the country into correspondence, some of those, who make general collections including all orders, may specialize their studies more, so that, while not giving up their general collection, they may make a particular study of some one order. A few have recently signified their determination to do this, and the specialists mentioned below will be glad to correspond with collectors concerning the insects mentioned in connection with their names. Canada is so large that specialists are urgently needed in every Province of the Dominion, not only of orders, but

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also of families, or even separate genera. The lepidoptera and coleoptera have always been fairly well worked, but specialists in the other orders are few, notwithstanding the good work which doubtless can be done. The hymenoptera, diptera, and hemiptera have a few devotees, but many of the other orders are almost entirely neglected. The orders which perhaps most demand attention at the present time, are the orthoptera and the neuroptera. It is strange, in view of the enormous damage sometimes done by locusts, that so few students have devoted attention to them. The odonata also offer an almost unworked field for original research. It is to be hoped that, before long, some will take up these orders more energetically than has been done in the past.

As a matter of course the reference collections, including all orders of insects of the Entomological Society of Ontario, at London, of the Division of Entomology, at Ottawa, and of the Agricultural College at Guelph, are being added to continually. To the best of their ability the officers at the Division of Entomology, at Ottawa, will name, or get named, insects in all orders, and will be glad to help or advise in any way in their power all applications for information concerning insects.

Collectors in the field have frequent opportunities of catching insects belonging to other orders than those which they study. I would point out that very little trouble is required to pin such specimens without setting them, and attach a label with the date and locality. These may then be put on one side in a cigar box, to be sent when convenient to specialists. In this way, with little labour great service may be done to entomology. If Canadian collectors will save specimens as suggested and forward them to me (parcels and letters concerning insects may be sent to me without postage), I shall be pleased to forward them to any specialists they may designate. The information conveyed with these specimens as to the distribution and date of occurrence of insects will be of great value in the official work of the Division of Entomology, and collectors will be at no expense for postage.

The following are making special studies :—

LEPIDOPTERA.

Rearing from the egg. Messrs. Lyman and Brainerd, of Montreal, Rev. Dr. Fyles, Quebec, Messrs. C. H. Young, Hurdman's Bridge. A. Gibson, and J. Fletcher, Ottawa, J.W. Cockle, Kaslo, B. C.

Diurnals. H. H. Lyman, Montreal, J. Fletcher, Ottawa, F. H. Wolley-Dod, Millarville, Alta

Nocturnals. The Genus Hydroecia, Messrs. A. F. Winn and H. H. Lyman, of Montreal, and J. A. Moffat, of London. The genus Apantesis (Arctia) A. Gibson, Ottawa. The Genus Carneades, F. H. Wolley-Dod, Millarville, Alta. The Geometridae.—Several collectors have agreed to make a special study of the geometers. The Rev. G. W. Taylor on the Pacific Coast and Mr. W. McIntosh, on the Atlantic seaboard, and the Division of Entomology of the Government Experimental Farm at Ottawa, have already begun a critical study of these moths. Messrs A. W. Hanham, and E. F. Heath have made large collections of the geometers of Manitoba. It is a favourite group with Mr. Hanham, who now lives at Victoria, and he will doubtless help in working up the Vancouver Island species. The Rev. G. W. Taylor, at a recent meeting of the British Columbia Entomological Society, showed four drawers of geometers containing 700 specimens representing 144 good species, nearly all of which had been taken this year at Wellington, B. C. Mr. Cockle has collected geometers assiduously in the Kootenays, and so much work on these interesting moths is now in progress that I have decided to hold over all references to captures in this family until next year's Record, when it is to be hoped that Dr. Dyar's anxiously looked for catalogue of the lepidoptera of North America, will have apppeared. In the same way, it is perhaps advisable, in the mean-

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time, not to record the varous species of Hydræcias which are being studied by many, as new light is daily being received, particularly through the excellent work of Mr. Henry Bird, of Rye, N. Y., in rearing the species from their food plants.

Coleoptera.

Our highest authority in this order is Mr. W. H. Harrington, of Ottawa. Mr. R. J. Crew, of Toronto, who has for many years done good work, is devoting special attention to the Pselaphidæ. Mr. J. D. Evans, of Trenton, is making a critical study of the genus Lachnosterna. And Mr. E. P. Venables, of Vernon, B. C., is going to devote his time specially to beetles.

Hymenoptera.

Mr. Harrington again is our leading authority in this order, and is constantly naming material. The hymenoptera of the Okanagan Valley in British Columbia, will be specially collected by Mr. Venables.

I have requested Mr. W. H. Harrington to prepare the record of hymenoptera for 1902, which he has kindly done. It would certainly be advantageous if each Order could be treated of by some one who is working specially upon it, and in future this may perhaps be arranged.

Diptera.

Large collections have been made by Mr. Harrington, at Ottawa, and Mr. G. Gagnon, at Montreal. Mr. Venables has collected many species of Tabanidæ at Vernon, B.C. Next season, Mr. W. McIntosh, of St. John, N. B., intends to devote much time to this order.

Hemiptera

Mr. W. H. Harrington has for many years collected these insects, and has named much material for correspondents. He has also published in the Ottawa Naturalist a list of the Ottawa species. During the past summer the Rev. G. W. Taylor has been studying the Vancouver Island forms with the help of Mr. E. P. Van Duzee, of Buffalo, and has collected this year about 125 distinct species. Mr. C. Stevenson, of Montreal, will study the heteroptera of the Island of Montreal, the Rev. T. W. Fyles, the scale insects of the Province of Quebec, and Prof. Lochhead, those of Ontario next season.

Orthoptera.

Mr. E. M. Walker, of Toronto, is so far our only authority in this order. In the west Mr. Norman Criddle, at Aweme, Man., and Mr. T. N. Willing, at various points in the Northwest Territories have collected material, which has added much to our knowledge of these insects.

The Season of 1902.

The wet dull season of 1902 in all parts of Canada has been very unpropitious for the collector of insects. The persevering collector, however, has as usual added little by little to his collection by constantly being on the alert. A few records of remarkable catches on certain evenings have been received from lepidopterists. Mr. E. Firmstone Heath, of Cartwright, Man., mentions May 22, as such, and Mr. A. J. Dennis, of Beulah, Man., had an exceptional experience of the same kind on June 11; Mr. J. D. Evans, of Trenton, Ont., and Mr. C. H. Young, of Hurdman's Bridge, Ont., also report good occasional nights, but in most places the season of 1902 must be characterised as exceptionally poor. Many of the well known crop pests were also noticeably less abundant than usual.

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The following list gives the names of the most active workers in Canada which have been heard from during the past year. There are doubtless many others, but I have not heard from them during 1902. The initials in parentheses after their names indicate the orders they are studying, or if they have general collections.

Anderson, E. M., Victoria, B. C. (L.)
Bethune, Rev. C. J. S., London, Ont. (Gen., L., C.)
Bégin, Rev. P. A., Sherbrooke, Q. (Gen.)
Bice, J., London, Ont. (L.)
Baird, Thomas, High River, Alta. (Gen.)
Browne, Edgar J., London Ont (L., C.)
Brainerd, Dwight, Montreal. (L.)
Bryant, Theodore, Wellington, B. C. (L.)
Bush, A., Vancouver, B. C. (L.)
Chagnon, Gus., Montreal. (D., C.)
Cockle, J. W., Kaslo, B. C. (L.)
Criddle, N., Aweme, Man. (L., Or., C.)
Crew R. J., Toronto. (C.)
Dennis, A. J., Beulah, Man. (L.)
Desrochers, Rev. J. E., Rigaud, Q. (L., C.)
Dod, F. H. Wolley-, Millarville, Alta (L.)
Draper, R., Vancouver. (L.)
Evans, J. D., Trenton, Ont. (Gen., L., C., Hym.)
Fletcher, Dr. J., Ottawa. (Gen., L., C.)
Fyles, Rev. Thos. W., Levis, Que. (Gen., L., Hym.)
Gibson, Arthur, Ottawa. (L.)
Grant, C. E. Orillia, Ont. (L.)
Gregson, P. B., Blackfalds, Alta. (Gen.)
Hanham, A. W., Victoria, B. C. (L., C.)
Harrington, W. H., Ottawa. (C., Hym., Hem., D.)
Harvey, R. V., Vancouver. (L., Odon.)
Heath, E. F., Cartwright, Man. (L.)
Huard, Rev. Victor. Quebec. (Gen.)
Jones, W. A. Dashwood, New Westminster. B. C. (L.)
Lochhead, Prof. W., Guelph, Ont. (Gen., Or.)
Lyman, H. H., Montreal. (L.)
McIntosh, W., St. John, N. B. (L., D., C.)
MacLaughlin, T. J., Ottawa. (Odon.)
Marmont, L E., Rounthwaite, Man. (L.)
Metcalfe, W., Ottawa. (L., C.)
Moffat, J. A., London. (L.)
Parsons, C., London. (L., C.)
Perrin, Jos., Halifax, N. S. (L.)
Norris, A. E., Montreal. (L., Hem.)
Ouellet, Rev. C. J., Montreal. (C., Hym.)
Richard, A. E., Ottawa. (L.)
Roy, Rev. Elias, Levis, Q. (C.)
Sandercock, W. C., Lauder, Man. (L.)
Simpson, Willibert, Ottawa. (C.)
Suffield, J. D., Morden, Man. (L.)
Sanson, N. B., Banff, Alta. (Gen., L.),
Schmitt, Dr. J., Anticosti. (Gen.)
Stevenson, Charles, Montreal. (L., Hem.)
Tanton, J., London, Ont. (L.)
Taylor, Rev G. W., Wellington, B. C. (L., Hem., C.)
Venables, E. P., Vernon, B. C. (L., C., Hym.)
Walker, E. M., Toronto. (Or. Odon.)
Winn, A. F., Montreal. (L.)
Wilson, E., Vancouver. (L.)
Wilson, Jno., Vancouver (L.)
Wilson, T., Vancouver. (L.)
Williams, J B., Toronto. (L.)
Willing, T. N., Regina. (L., Or., C.)
Young, C. H., Hurdman's Bridge, Ont. (L.)

NOTES OF CAPTURES.

LEPIDOPTERA.

(*Arranged according to Smith's List of the Lepidoptera of Boreal America.*)

RHOPALOCERA.

Argynnis idalia, Dru. Aweme (Criddle).

Argynnis astarte, Db.-Hw. Sulphur Mountain, Banff, 27 June; (Sanson). Mountain just above Lake Agnes, Laggan, B. C., 18 Aug. (Dr. W. Barnes).

Argynnis triclaris, Hbn. Nepigon, 12 July. Not previously taken at this locality. The specimen was a female from which about a dozen eggs were obtained and the larvæ were carried to hibernation. Food plant, *Viola eu-cucullata*. Fletcher).

Melitæa Harrisii, Scud. Abundant, Halifax, N. S. (Perrin).

Grapta gracilis, G. & R. Anticosti, (Dr. J. Schmitt).

Cœnonympha inornata, Edw. Several specimens of this little satyrid have been taken during the past summer in localities very distant from previous records. Rockcliffe, Ottawa, near the Rifle Range, 14 June, (Richard); Piedmont, Que. (Norris). St. Hilaire, Que., 22 June, (Stevenson).

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Erebia disa, Thunb., var. *mancinus*, Db.-Hw. A few specimens of this very local species were taken by Mr. N. B. Sanson at Banff, Alta., in the middle of July. Mr. Sanson obtained eggs, from which larvæ at Ottawa are now hibernating after second moult.

Chionobas jutta, Hbn. A new locality for this species has been found by Mr. A. E. Richard at Langevin, Que., 50 miles south of Quebec city, 27 July.

Thecla spinetorum, Bdv. A fine male of this rare species was taken at Fairview, B. C., (Edmund Reynolds).

Thecla irus, Gdt. Anticosti, (Schmitt).

Chrysophanus dorcas, Kirby. Rounthwaite, Man., (Marmont).

Papilio cresphontes, Cram. More abundant than for many years, London, (Moffat).

Pieris napi, Esp., var. *bryoniæ*, Ochs. Banff, Alta., 3 May, (Sanson).

Papilio nitra, Edw. High River, Alta., (T. Baird).

Pamphila pawnee, Dodge. Cartwright, (Heath). Aweme, (Criddle).

Terias lisa, Bd-Lec. Ottawa, 18 Oct. (Gibson).

Carterocephalus mandan, Edw. Halifax, (Perrin).

HETEROCERA.

Lepisesia ulalume, Strk. Mr. Harvey writes to me that the specimen credited to him in last year's record was taken by Mr. E. Wilson. Two fresh records have been received for 1902. 26 May, Vancouver, B. C., (Bush); and a second by the Hon. N. C. Rothschild, near the same place.

Deidamia inscripta, Harr. London, (J. Bice and J. Tanton).

Philampelus pandorus, Hbn. Trenton, 20 Aug., (Evans).

Ampelophaga versicolor, Harr. London, (J. Bice).

Protoparce cingulata, Fab. "St. John, 5 Oct. I had no occurrence of this fine hawk-moth in New Brunswick until now. I have just caught two specimens." (McIntosh).

Albuna pyramidalis, Walk. This species is not uncommon at Nepigon, north of Lake Superior, and may frequently be seen along the railway track. In July last the writer took five specimens flying around a raspberry bush. There were two females and three males, and the variations of colour covered all the three varieties, var. *montana*, var. *rubescens* and var. *coloradensis*, which are recognized in Beutenmuller's Monograph of the Sesiidae. The two varieties *rubescens* and *coloradensis* were also taken this year at Vancouver by Mr. Harvey, and the var. *montana* by Mr. Cockle at Kaslo.

Sesia albicornis, H. Edw. A specimen taken at Ottawa some years ago by the Rev. G. W. Taylor is this species. It has not been previously recorded for this locality.

Sarrothripa columbiana, H. Edw. Victoria, May, (Anderson and Hanham).

Arctia yarrowi, Stretch. This rare species only once previously recorded in Canada from Hudson Bay by Dr. Robert Bell, was taken on 18 Aug. last in the Rocky Mountains, on a bare summit above Lake Agnes, Laggan, Alta., (Dr. W. Barnes).

Several other species of *Arctia* which have been recorded, are now receiving special study and will be reported on later.

Phobetron pithecium, A. and S, Mt. St. Hilaire. Q. (Stevenson).

Euproctis chrysorrhœa, L. The first Canadian specimen of the Brown-tailed Moth, which has been so destructive around Boston, Mass. was taken at St. John, N. B., by Mr. McIntosh this year. No others were seen.

Datana contracta, Walk. Trenton, 10 to 24 July, (Evans).

Gluphisia severa, H. Ed. "Have had a single specimen in my collection for years." Cartwright, June, (Heath). Kalso, (Cockle).

Hepialus montanus, Stretch. Dr. Barnes reports this as common at Vancouver and Victoria.

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Hepialus mustelinus, Pack. St. John, common, (McIntosh). Anticosti, (Schmitt). Ottawa, (Young, Gibson).

Bombycia improvisa, H. Ed. Victoria, 19th October, (Hanham). 26th October, (Anderson).

Bombycia semicircularis, Grt. New Westminster, (Jones). Victoria, 19th June, (Hanham).

Bombycia Tearlii, H. Ed. New Westminster, (Jones).

Feralia major, Smith. Ottawa, 20th April, (Fletcher). Toronto, (Gibson).

Momophana Comstocki, Grt. Victoria, 16th April, (Anderson). New Westminster, (Jones).

Acronycta hesperida, Smith. Kaslo, Eggs sent 4th July. (Cockle). Bred specimen 28th June, Vancouver, (Harvey).

Acronycta hæsitata, Grt. Meech Lake, Que., 2nd June, (Young).

Acronycta perdita, Grt. Victoria, (Anderson).

Acronycta Canadensis, Sm. Larva on poplar; pupa Aug., 1901; imago 27th May, 1902. Kalso, (Cockle).

Chytonix sensilis, Grt. Meech Lake, Que., 7th June, (Young).

Semiophora elimata, Gn. St. John, 24th July, (McIntosh).

Semiophora Youngii, Sm. Mer Bleue, Ottawa, 18th Sept. (Young, Gibson).

Agrotis genicula, G. & R. Meech Lake, Que., 9th June, (Young).

Noctua jucunda, Walk. Meech Lake, Que., 26th July, (Young).

Noctua rubifera, Grt. Meech Lake, 25th July, (Young).

Noctua atricincta, Beulah, Man., (Dennis).

Porosagrotis mimallonis, Grt. Meech Lake, 31st July, (Young).

Carneades fumalis, Grt. Meech Lake, 3rd Sept., (Young).

Carneades velleripennis, Grt. Meech Lake, 25th Aug., (Young).

Carneades reuda, Strck. Victoria, 1st Sept., (Anderson).

Carneades pleuritica, Grt. Aweme, Man., (Criddle).

Carneades titubatis. Victoria, 1st Sept., (Anderson).

Carneades vetusta, Walk. Victoria, (Hanham).

Carneades vulpina, Sm. Kalso, 27th July, (Cockle).

Carneades Ridingsiana, Grt. Kalso, 22nd Aug., (Cockle), Beulah, (Dennis).

Mamestra circumvadis, Sm. Jl. N. Y. Ent. Soc., 1902, p. 42. Aweme, (Criddle). Cartwright, (Heath).

Mamestra obscura, Sm. Cartwright, (Heath).

Mamestra anguina, Grt. Cartwright. Several; have previously only seen an odd one at long intervals, (Heath).

Mamestra rectilinea, Sm, Victoria, Aug., 23, (Anderson).

Scotogramma sedilis, Sm. Kaslo B. C., (Cockle). Very rare.

Scotogramma inconcinna, Sm. Kaslo, (Cockle).

Hadena nigrior, Sm. Meech Lake, 14th June, (Young).

Hadena claudens, Walk. Victoria, (Anderson).

Hadena cariosa, Grt. Meech Lake, 16th July, (Young).

Hadena plutonia, Grt. "At sugar", Cartwright, 12th July, (Heath).

Hadena algens, Sm. Meech Lake, 12th Sept., (Young).

Hadena binotata, Walk. Victoria, B. C., July, (Harvey).

Oncocnemis Barnesii, Sm. Kaslo, B. C., (Cockle). This was described from the unique type in Dr. Barnes's collection, taken in Yellowstone Park.

Oncocnemis riparia, Morr. Aweme, (Criddle).

Macronoctua onusta, Grt. Two specimens reared from larvæ feeding in and on stems of *Iris versicolor*, L., emerged 3rd Sept., Montreal, (Winn). Belleville, 1880, (Evans). Ottawa, 29th Sept., 1902, (Fletcher).

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Hydrœcia inquæsita, G. & R. Two specimens, 12th and 25th Sept., Ottawa, (Young). Trenton, (Evans).

Hydrœcia cerussata, Grt. Ottawa, two specimens, 8th Sept., (Fletcher, Young).

Hydrœcia marginidens, Gn. Larva common in stems of *Cicuta*, near Montreal West, end of July, (Winn).

Several other species of *Hydrœcia* have been reported, but there is so much confusion in the genus that for the present they are held over. Those mentioned above have been identified by Mr. Henry Bird.

Arzama diffusa, Grt. Trenton, (Evans).

Arzama densa, Walk. Vancouver, (Harvey).

Tæniocampa oviduca, Grt. Meech Lake, Que., 26th May, (Young).

Tæniocampa culea, Gn. Meech Lake, Que., 31st May, (Young).

Tæniocampa subterminata, Sm. Vancouver, abundant, (T. Wilson, Bush and Harvey).

Perigrapha transparens, Grt. 3 specimens, April, Vancouver, (Harvey).

Scopelosoma devia, Grt. Ottawa, 22nd April, (Young).

Ipimorpha pleonectusa, Grt. "A leaf roller on poplar," Kaslo, (Cockle). Victoria, (Anderson).

Xylina Baileyi, Grt. Wellington, (Taylor).

Xylina gausapata, Grt. Victoria, 21st Oct., (Anderson). This is a very rare species.

Xylina Thaxteri, Grt. New Westminster, (Jones).

Xylina holocinerea, Sm. Wellington, April, (Taylor). New Westminster, (Jones).

Xylina fagina, Morr. 16th April, Ottawa, (Young). Wellington, 17th April, (Taylor). New Westminster (Jones).

Xylina ferrealis, Grt. Sept., Ottawa, (Gibson).

Plusia formosa, Grt. St. John, July 24, 2 specimens. (McIntosh).

Plusia mappa, G. & R. Hatzic, B. C., July, (R. Draper). Victoria, (Taylor). St. John, N. B., Not uncommon. (McIntosh).

Plusia metallica, Grt. =*scapularis*, H. Ed., and *lenzii*, Behr. Kalso, (Cockle). Wellington, (Taylor). Victoria, July 7, (Anderson).

Plusia rectangula, Kirby = *mortuorum*, Gn. St. John, common, (McIntosh). Montreal, 5 sp., 19th Aug., (Norris). Wellington, (Taylor). Victoria, (Anderson).

Plusia diasema, Dalm. A few specimens of this fine species have been taken at Kalso by Mr. Cockle in August.

Plusia alias, Ottol. This species has in the past been confused with *rectangula*, which it resembles, but has less silver. It has also been commonly labelled *u-aureum*, but has been recently characterized by Mr. Ottolengui as a species under the name of *alias*. St. John, common, (McIntosh).

Plusia excelsa, Ottol. Kaslo, July 31, (Cockle).

Plusia variana, Ottol. St. John, (McIntosh).

Plusia rubidus, Ottol. St. John, (McIntosh).

Melaporphyria ononis, Fab. Cartwright, (Heath). "Have not seen it for many years." A day-flyer. July, Lauder, Man., (Sandercock). Beulah, (Dennis).

Copablepharon absidum, Har. Five specimens of this striking moth were taken by Mr. Criddle at Aweme, on July 11; three of these have a subterminal row of very fine dark brown dashes across the primaries.

Heliothis phlogophagus, G. & R. Beulah, Man., (Dennis).

Anarta melanopa, Thunb. Mount Cheam, B. C., 14th Aug., (Bush and Fletcher).

Annaphila diva, Grt. Vancouver, June, (Bush).

Catocala hermia, H. Ed. Hatzic, Aug., (Draper).

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Catocala elda, Behrens. Hatzic, B. C., (Draper).

Pseudolimacodes littera, Gn. Two specimens of this pretty little moth have been taken at Ottawa in June. (Gibson, Young).

Erebus odora, L. Vancouver; found in an electric light, (Bush). We now have records of this fine immigrant right across Canada, from ocean to ocean. It is very remarkable if the species does not breed in Canada.

Capis curvata, Grt. At light, Cartwright, (Heath).

Brephos infans, Moeschl. This interesting little moth has now been recorded from the Atlantic to the Pacific. St. John, (McIntosh). Montreal, 25th March, (Norris). Ottawa, April, (Fletcher). Toronto, April, (Gibson). Aweme, Man., (Criddle). High River, Alta., (T. Baird). Banff, Alta., (Sanson). Victoria, B. C., (Anderson). Nanaimo and Wellington, B. C., (Taylor).

COLEOPTERA:

Cicindela montana, Lec.

Cincindela formosa, Say, var, *Manitoba*, Leng.

Cincindela scutellaris, Say, var. *Lecontei*, Hald.

Cincindela venusta, Lec.

All of the above 4 species have been taken at Aweme by Mr. Criddle.

Cychrus viduus, Dej. Several specimens of this handsome beetle are recorded as captured in 1902. St. John, (McIntosh). Mount St. Hilaire, Q., June 11; two other specimens were taken at the same place three years ago, (Chagnon). Mt. St. Hilaire, Q. July 1. (Stevenson).

Blethisa Julii, Lec. Specimens were taken at Quebec some years ago, (Hanham).

Blethisa quadricollis, Hald. Hull, Q., and Buckingham, Q., (Harrington).

Blethisa multipunctata, L. Two specimens under dead leaves, Montreal, Sept., (Chagnon).

Blethisa Oregonensis, Lec. Victoria, (Taylor).

Calathus advena, Lec. St. John, (McIntosh).

Galerita janus, Fab., Rigaud, May 25, (Stevenson).

Platynus anchomenoides, Rand. St. John, (McIntosh).

Platynus excavatus, Dej. St. John, (McIntosh).

Platynus 4-punctatus, Dej. St. John, (McIntosh).

Platynus nigriceps, Lec. Rare; Toronto, May 15, (Crew). Nepigon, (Fletcher).

Callida punctata, Lec. Montreal, July 11, on flowers, (Chagnon).

Brachylobus lithophilus, Say. Toronto, rare, May 15, (Crew).

Harpalus pleuriticus, Lec. St. John, (McIntosh.)

Harpalus laticeps, Lec. St. John, (McIntosh).

Sphæridium scarabæoides, L. Toronto, (Crew). This interesting beetle first appeared at Toronto about three years ago, and is evidently spreading through Canada.

Cercyon indistinctum, Horn. Trenton, (Evans).

Pselaphus Erichsonii, Lec. Toronto, (Crew). Ottawa, (Harrington).

Gymnusa brevicollis, Grav. Toronto, rare, (Crew).

Quedius vernix, Lec. Wilcox Lake, north of Toronto, under a stump, March 28; two specimens, (Crew).

Tachyporus jocosus, Say. St. John, May 1, (McIntosh).

Coccinella monticola, Muls. St. John, (McIntosh).

Aphorista læta, Lec. Vernon, (Venables). Kaslo, (Cockle).

Hister semiruber, Casey. Aweme, Man. (Criddle.) Blackfalds, Alta. (Gregson).

Hister coarctatus, Lec. Trenton, (Evans).

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Ips obtusus, Say. In running sap on an oak tree, Toronto, Sept. 7th, very rare. (Crew).

Prionocyphon discoideus, Say. June 28, St. John, (McIntosh).

Cyphon concinnus, Lec. Vernon, (Venables).

Calochromus dimidiata, Lec. Osoyoos, (C. de B. Green).

Corymbites medianus, Germ. "Trout Creek," Toronto, June 5, (Crew).

Corymbites hamatus, Say. "Trout Creek," Toronto, June 5, rare, (Crew).

Chrysophana placida, Lec. Vernon, (Venables).

Malachius æneus, L. St. John's, Que. June 9, (Chagnon).

Xestobium elegans, Horn. Anticosti, (Schmitt).

Oupes capitata, Fab. Toronto, August 15, rare, (Crew).

Hylecœtus lugubris, Say. A pair of this rare and interesting Lymexilid was taken this season on an old maple stump at Rigaud, Que., by Rev. Father Desrochers. He had also previously taken two females at the same place. The female differs from the male in having the head and thorax reddish orange.

Canthon simplex, Lec. Macleod, Alta., June 20, (Fletcher).

Xyloryctes satyrus, Fab. Two specimens of this fine scarab were taken at Trenton, 6 June (Evans). Ottawa, (Fletcher, Harrington).

Tylonotus bimaculatus, Hald. Trenton, 27 August, at light, had only two specimens before, (Evans).

Obrium rubrum, Newm. Trenton, (Evans). This rare little longicorn is occasionally found at Ottawa on hickories.

Neoclytus caprœa, Say. St. John, (McIntosh).

Desmocerus cribripennis, Horn. Vancouver, May, (Harvey). Vernon, (Venables).

Toxotus obtusus, Lec. Vernon, (Venables).

Anthophylax mirificus, Bland. One male, Kaslo, (Cockle).

Acmaeops bivittata, Say. Calgary, (Fletcher).

Acmaeops atra, Lec. Vernon, (Venables).

Acmaeops subpilosa, Lec. Vernon, (Venables).

Acmaeops longicornis, Kirby, Vernon, (Venables).

Gaurotes Cressoni, Bland. Vernon, (Venables).

Bellamira scalaris, Say. Ottawa, (Fletcher).

Leptura sanguinea, Lec. St. John, (McIntosh).

Leptura lineola, Say. Beaten from dogwood blossoms, "Trout Creek," Toronto, June 9, (Crew).

Leptura vagans, Oliv. With the above, (Crew).

Leptura vexatrix, Mann. Blackfalds, Alta. June 3, (Gregson).

Leptura tibialis, Lec. Anticosti, (Schmitt).

Encyclops cœruleus, Say. "Trout Creek," Toronto, (Crew).

Goes debilis, Lec. "Trout Creek," Toronto, June 9, (Crew).

Goes oculata, Lec. with the above, rare, (Crew).

Eupogonius vestitus, Say. Also with the above, rare, (Crew).

Chrysochus cobaltinus, Lec. Vernon, (Venables).

Monoxia punctricollis, Say.

Many specimens, very variable. Halifax, N.S., (Evans).

Microrhopala excavata, Oliv. Say. St. John, July 24, (McIntosh).

Cassida viridis, L. This European tortoise beetle has evidently established itself in Canada. Dr. Fyles has referred to it in the Canadian Entomologist XXXIV., p. 273, and his note has been commented upon by Rev. Elias Roy, in Le Naturaliste Canadien, 1902, p. 145, as *C. thoracica*, Illig. Dr. Fyles has recently referred his specimens to

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the British Museum and has received the following report from Mr. C. O. Waterhouse: "I have carefully examined the Cassida you send, and I am sure it is our common thistle species *C. viridis*." Mr. Winn reports that it was common in all stages at Levis, Que., on Aug. 21, feeding upon dock and thistle.

Mordella serval, Say. St. John, July 24, (McIntosh).

Mordella borealis, Lec. St. John, (McIntosh). Both this and *M. serval* are rare species.

Corphyra inconspicua, Horn. A specimen of this Californian species was taken at Vernon by Mr. Venables.

Calopus aspersus, Lec. Vernon, (Venables).

Rhinomacer pilosus, Lec. St. John, June 9, McIntosh).

Myodites scaber, Lec. Vernon, (Venables).

Myodites zeschii, Lec. St. John, (McIntosh). Abundant in the beginning of July on the buds of Solidago at Nepigon, (Fletcher).

Peritelopsis globiventris, Lec. Vernon, (Venables).

Geoderces melanothrix, Kirby. St. John, June 23, (McIntosh).

Phytonomus punctatus, Fab. Victoria, July, (Hanham). This Clover Weevil has apparently spread to the Pacific province and is there in considerable numbers. Mr. Hanham writes that during the last week in July he took 100 specimens on his tennis lawn from pieces of board put there for the purpose of trapping insects, and he could collect specimens at any time during the season by the same method. He saw no sign of the fungous disease which usually controls this insect in the east.

Gryphidius equiseti, Fab. St. John, July 8, (McIntosh).

Lixellus filiformis, Lec. and *Lixus rubellus*, Rand. Appear to be quite common on plants growing at the edge of a lake in Mount St. Hilaire, Que. The former is often found on weeds emerging only a few inches from the water, and growing sometimes forty or fifty feet from the shore. Some of the specimens are covered with a hard coat of mud. *L. rubellus*, Rand., is found on plants growing close to the water's edge, (Chagnon).

Orthoptera.

Mr. E. M. Walker, of Toronto, has continued his studies of the Canadian locusts and their allies, and has published some of his results in the *Canadian Entomologist*, but has been prevented this year by other work from preparing a report upon recent captures. He however sends the following notes on species of special interest:

Melanoplus Bruneri, Scudd., a single male was taken at Dwight, Northern Muskoka, 2nd September. This is of special interest, as it is a western species known only previously from Alberta and some of the western states. (Walker.)

Xiphidium saltans, Scudd., another western insect, which was taken in considerable numbers in a certain part of High Park, Toronto, during August and September. They occurred in bunches of rather long grass on sandy soil, and were in company with *Melanoplus Dawsoni*, Scudd., among other Orthoptera. Both *X. saltans* and *M. Dawsoni* are species belonging to the western prairies and their occurrence together so far east is of some interest. (Walker.)

Odonata.

A few workers have collected Dragon-flies during 1902 and more extensive work is planned for next season. Several observers have reported the extraordinary numbers of these insects seen on the prairies during the past season. Mr. Harvey, of Vancouver, Mr. E. M. Walker, of Toronto, and Mr. T. J. McLaughlin, of Ottawa, have sent in short lists of species. These will be reported upon in the next Entomological Record.

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HYMENOPTERA.

By W. Hague Harrington, Ottawa.

Collectors are being gradually attracted to this important order, and several nice lots have been sent in for determination. Among those who are now collecting may be mentioned Mr. R.V. Harvey, Vancouver, B.C.; Mr. E. P. Venables, Vernon, B.C.; Mr. A. G. Leavitt, St. John, N.B.; Mr. J. B. A. Leo Leymarie, Montreal, and Dr. Schmitt, Anticosti Island, Que. This number will undoubtedly increase as our members realize how much of interest from the scientific standpoint, and how much of importance from an economic aspect the species of this order possess. The enormous number of species, even in our northern regions, ensures the continual discovery of rare and new forms, thus giving a frequent stimulus to the collector and student of them. Indeed, the trouble at present is not so much to obtain new material as to determine and utilize what is received. This difficulty will gradually disappear as specimens become named and arranged in a greater number of accessible collections, and as classifications are placed upon a more durable basis and synopses and descriptive monographs are multiplied.

No works dealing specially with Canadian Hymenoptera have, I think, appeared during the year, but the several entomological magazines have contained various articles in which species from Canada are described or mentioned. Ashmead has continued in the *Canadian Entomologist* his valuable papers on the "Classification of the Fossorial, Predaceous and Parasitic Wasps, or the Super-family Vespoidea," and in the November number of the *Canadian Entomologist* the family Trigonalidæ is reached and tabulated. An annotated list of the Ottawa species of the Super-family Sphegoidea was published in the *Ottawa Naturalist*, vol. xv. p. 215, January 1902 (Harrington). Though not treating of Canadian specimens, the "Papers from the Harriman Alaska Expedition" are of extreme interest and value, as a large proportion of the insects catalogued and described are certain to be distributed through our adjacent territories, some indeed being transcontinental in their distribution. The entomologist to the expedition was Prof. Trevor Kincaid, and the extent of his collections testify to his ability and assiduity. He has discussed the Tenthredinoidea in paper No. vii., enumerating over fifty species, of which more than one-half are new. He has also, in paper No. xiv., dealt with the Sphegoidea and Vespoidea, of which only nine species occurred, two of which are new. The Formicoidea yielded only six species which were considered by Pergande. All the rest of the Hymenoptera were placed in Ashmead's hands and proved very rich in new species. His report, paper No. xxviii., contains not only the descriptions of these but is a complete catalogue of all species now known from Alaska. These number in all 335 species of which he describes 201 as new. This will give some idea of the yet unknown riches of our own northern fauna. An interesting paper has been received from Dr. Kiaer of Tromso Museum, Norway- "Die arktishen Tenthrediniden"—a catalogue of the Arctic sawflies of Europe, Asia and America, which enumerates a number of Canadian species.

The material amassed during the past season by our various collectors is as yet largely undetermined; even the Ottawa species showing a very large proportion unnamed. The following list, therefore, does not pretend to give in any measure a complete record, but mentions only a few of the species which appear of more than ordinary interest:

Bombus frigidus, Smith. This is an Arctic species recorded from Great Slave Lake and the Yukon River. Females and workers received from Anticosti Island (Schmitt).

Bombus juxtus, Cress. From Goldstream, B.C. (Harvey).

Bombus mixtuosus, Ashm. One of the new species described from Alaska. Specimens from Vancouver (Harvey), Rocky Mountains, Laggan? (Bean) and Banff, Alta., (Fletcher). A worker minor from Nepigon (Fletcher) may also possibly belong to this species.

Bombomelecta thoracica, Cress. Vernon, B.C. (Venables).

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Perdita 8-maculata, Say. A pretty little species from St. John, N.B., (Leavitt).

Spilomena pusilla, Say. This little species, the smallest of our Sphegoidea, was omitted from the recently published list of Ottawa species. The single example taken had been placed with some unexamined proctotrypids, some forms of which it superficially resembles. Ottawa (Harrington).

Thyreopus latipes, Smith. Not known to me before from the Pacific coast. Two males from Victoria (Harvey), and one from St. John, N.B. (Leavitt.)

Odynerus arvensis, Sauss. Male from Trenton, Ont. (Evans).

Polybia flavitarsis, Sauss. This seems to be a common species in Vancouver Island. Specimens received from Victoria (Taylor and Harvey).

Ibalia maculipennis, Hald. This interesting cynipid has been taken at Montreal (Chagnon).

Ichneumon viola, Cress. A fine distinct species from Goldstream, B.C. (Harvey).

Thalessa Nortoni, Cress. This large ichneumon-fly seems to be widely distributed but rare, and has hitherto been vainly sought at Ottawa. From Levis, Que. (Fyles), Victoria, B.C. (Harvey), Mount Ché-am, Fraser River, B.C. (Fletcher).

Dyseidopus Vancouverensis, Bradley. A new species described in *Entomological News*, vol. xiii., p. 307, December, 1902, from Vancouver, B.C. (Harvey).

Odontomerus bicolor, Cress. Victoria, B.C. (Harvey).

Metopius pollinctorius, Say. A large and striking tryphonid, Ottawa (Harrington).

Tremex columba, Linn. A common eastern species, Vernon, B.C. (Venables).

Calamenta (Cephus) trimaculatus, Say. Seems to be a rare species. Trenton (Evans).

Lyda atrata, Cress. One male only has been taken near Ottawa (Evans).

Bactrocerus excavatus, Nort. Also a rare form from Trenton (Evans).

Schizoceros plumiger, Klug. Taken for first time in Canada at Deloraine, Man. (Fletcher)

Hylotoma rubiginosa, Beauv. Also an addition to our saw-flies. Nepigon, Ont. (Fletcher).

Blenocampa inhabilis, Nort. St. John's, Que. (Chagnon), Halifax, N.S. (Evans).

Anoplonyx Canadensis, Hrgtn. A new species described from Ottawa (Harrington).

Trichiocampa gregarius, Dyar. St. John's, Que. (Chagnon), Ottawa (Harrington).

Pteronus magus, Marlatt. This species was described from Canada, but no locality was given. A fine female was taken at Trenton, Ont. (Evans).

Taxonus nigrisoma, Nort. This common species has been found to have the habit of boring into apples before pupating (Fletcher).

Pachyprotasis nigrofasciata, Esch. Taken by Kincaid in Alaska and found by him to be identical with *Macrophya omega*, Nort. A species with a wide distribution in the United States and Canada. Its records include the Pacific coast, Saskatchewan and Labrador. Now received from Anticosti Island, Que. (Schmitt).

Macrophya fuliginea, Nort. This species seems rare and local. Montreal (Ouellet).

Macrophya albilabris, Hrgtn. Male from Montreal (Ouellet). Female not known.

Macrophya Oregona, Cress. First occurrence in Canada. Vancouver, B.C. (Harvey).

Homœoneura 14-punctata, Nort. Occurs rarely at Ottawa (Harrington). Montreal, Ouellet).

Tenthredo nigrisoma, Hrgtn. Inhabits British Columbia and Alaska. Vancouver (Harvey).

Tenthredo eximia, Nort. At Ottawa, a rare species. Montreal (Ouellet).

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DIPTERA.

By W. Hague Harrington, Ottawa.

Scant attention is given to the members of this order by our collectors, and no papers have been published recently regarding our flies except that of Mr. Chagnon upon the Syrphidae of the Province of Quebec which first appeared in the Naturaliste Canadien for 1901, but is now issued as a pamphlet of 75 pages in which he describes 33 genera aud 71 species. Mr. Chagnon seems to be the only Canadian collector specially studying diptera. A few are taken occasionally by other members, but in most collections these insects are probably unnamed. Lists have been received from Mr. Harvey, of Vancouver, and Mr. McIntosh, of St. John, N. B. These will be reported at a latter date. Dr. Schmitt, of Anticosti Island, has forwarded some from that unworked locality, but many of the species have yet to be determined. Since the discovery of the carrying of fever germs by mosquitoes, special attention has been directed to these forms in America and elsewhere, and many new species have been described, and much has been learned of the larval habits of different species which was formerly unknown. The wave of investigation has however been but slightly felt in Canada.

The following eleven species of diptera have been added to our fauna at intervals ;

Sciophila subcœrulea, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxiii, p. 595—Canada, New Hampshire and Pennsylvania. Ottawa (Harrington).

Dryomyza aristalis, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxiii, p. 617—Ottawa, Can-(Harrington).

Culex Fletcheri, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 84—Alberta and Assiniboia (Fletcher).

Simulium fulvum, Coq. n. sp. Proc. U.S. Nat. Mus., Vol. xxv, p. 96—Montana, Colorado, Alaska and British Columbia. Calgary, Medicine Hat, N. W. T. and Mt. Cheam, B. C. (Fletcher). Laggan, B. C. (Wickham).

Oestrophasia calva, Coq. n. sp. Proc. U.S. Nat. Mus., Vol. xxv, p. 109—Arizona, Canada. Ottawa (Harrington).

Exoristoides Harringtoni, Coq. n. sp. Proc. U.S. Nat. Mus. Vol, xxv, p. 110—Ottawa (Harrington).

Mydæa flavicornis, Coq. n. sp. Proc. U.S. Nat. Mus. Vol. xxv, p. 123. Missouri, Canada. Rouville, Q. (Chagnon).

Tephronota Canadensis, Johnson, n. sp. Ent. News. Vol. xiii, p. 144—Rigaud, Que. (Chagnon).

Psilocephala grandis, Johnson, n. sp. Can. Ent. Vol. xxxiv, p. 241—Rouville, Que. (Chagnon).

Pyrgota Chagnoni, Johnson, n. sp. Can. Ent. Vol. xxxii, p. 246—Montreal. (Chagnon).

Tipula decora, Doane, n. sp. Journ. N.Y. Ent. Soc. Vol. ix, p. 125—Montreal (Chagnon).

Mr. Chagnon writes : My most important capture among the Syrphidæ is a specimen of *Merodon equestris*, Fab. This is new to North America and is an interesting addition to our fauna. Mr. McIntosh has also added many new species to the Canadian list, all of which have passed through Mr. Coquillett's hands.

A KEY TO ORCHARD INSECTS.

By W. Lochhead, Ontario Agricultural College, Guelph.

Signs are not wanting that our fruit growers desire more definite information about the insects commonly met with in the orchards. They want to *know* the insects which they are constantly fighting. They want to *spray intelligently* and with a definite purpose in view, and not by a blind *rule-of-thumb*, as set forth in some spray calendar.

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The day is fast approaching when the successful fruit-grower will not dare to neglect the study of insects. He must know, or recognize, the authors of the injuries done to his trees and shrubs, if he ever hopes to get the largest returns for his investment.

In the following *Key to Orchard Insects* an attempt is made to group the insects according to (1) the host-plant attacked; (2) the particular part or parts of the host-plant attacked; (3) the character of the injuries; and (4) in some instances, the most peculiar characteristic habits. Insects are known by their work. Every insect has its own peculiar mode of working, and when the injurious insect is once recognized and its habits known, it is usually not difficult to follow a line of treatment which will be successful.

Remedies are not given here. They may be found in the Spray Calendar, (Bulletin 122), published by the Department of Agriculture, Toronto.

From the stand-point of the fruit-grower, the *mouth-parts* of insects are the most important portions of their anatomy. Consequently, a special study should be made of these parts. The young and adults of beetles, grasshoppers, and crickets have *biting* mouth-parts, hence they can usually be readily killed by the application of Paris Green, or some other poisonous substance to their food. The adults of butterflies and moths have *sucking* mouth-parts, hence cannot be killed by poisons. These, however, are not usually injurious. The young forms of these, known as caterpillars, have *biting* mouth-parts, hence they can be poisoned. Both the young and adult forms of bugs and plant lice have *sucking* mouth-parts, hence they must be treated with powders, liquids or gases that kill by contact or suffocation.

It is also of importance that the fruit-grower learn to recognize the larvæ, for they are usually the most injurious stage of insect life. The young of moths and butterflies, usually called *caterpillars*, are in most cases 16-legged, with the exception of the *loopers* which are 10-legged. The *grubs* or *worms* of saw-flies are 20-legged. The young of beetles, or grubs, are usually 6-legged. The maggots of flies, bees and wasps are usually *legless*. The young of grasshoppers, bugs and plant-lice are 6-legged, and resemble more or less the adult forms.

In the preparation of this *Key*, the writer received valuable aid and suggestions from the writings of Dr. A. D. Hopkins, of West Virginia; Prof. L. Bruner, of Nebraska; Dr. W. Saunders, of Ottawa; and Dr. Bethune, of London.

Key to Apple Insects.

A. *Attacking the Roots*:

1. Causing knots or swellings on the smaller roots—bluish-white mouldy lice.
Woolly Aphis (Schizoneura lanigera), Fig. 64.

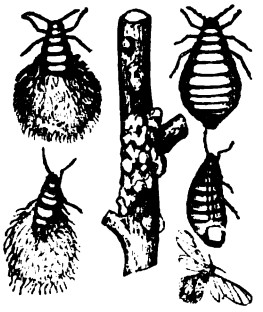


Fig. 64. Woolly Aphis.

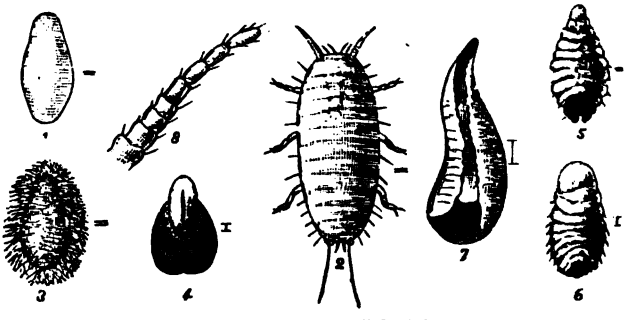


Fig. 65. Oyster-shell Bark-louse.

B. *Attacking the Trunk, Branches, and Twigs*:

1. Producing longitudinal slits in the bark; eggs under the edges of the slits.
Buffalo Tree-hopper (Ceresa bubalus). See Fig. 7.

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a. *Fixed to Bark* :

1. Producing an ashy-gray incrustation on the bark ; scales round, and gray and black.

   San José scale (Aspidiotus perniciosus). See Figs. 4 and 5.

2. Bark rough with mussel-shaped scales.

   Oyster-shell Bark-Louse (Mytilaspis pomorum). Fig. 65.

3. Bark scurfy with white scales.

   Scurfy Bark Louse (Chionaspis furfurus). Fig. 66.

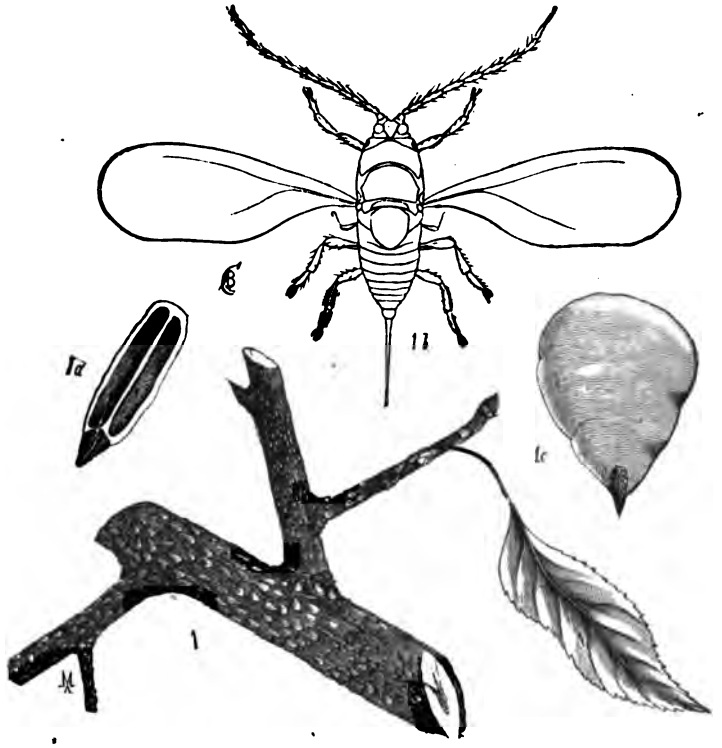


Fig. 66. The Scurfy Bark-louse.

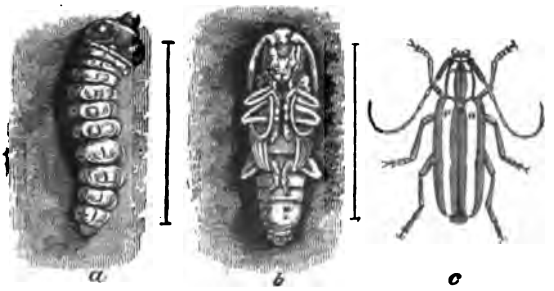


Fig. 67. Saperda Candida : (*a*) borer ; (*b*) pupa ; (*c*) beetle.



Fig. 68. Osmoderma scabra.



Fig. 69. Scolytus beetle.

b. *Making Tunnels in the Wood* :

1. Large square-headed legless borer, at or near the ground in tunnels, with saw-dust-like excrement.

   Round-Headed Borer (Saperda candida). Fig. 67.

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2. Large flat-headed, legless borer, in upper trunk in tunnels, with saw-dust-like excrement

Flat-Headed Borer (Chrysobothris femorata).

3. Large larva in decaying wood.

Eyed Elater (Alaus oculatus) and *Rough Osmoderma* (Osmoderma scabra). Fig. 68.

c. Making tunnels between the Bark and Wood:

1. *Fruit Bark Beetle* (Scolytus rugulosus). Figs. 69 and 70.

d. White woolly patches on the twigs which are usually scarred:

Woolly Aphis (Schizoneura lanigera).

e. Green soft-bodied insects in clusters on young growths, and particularly at ends of twigs, producing distortions:

Apple Aphis (Aphis mali). Fig. 71.

f. Snout Beetles gnawing off the bark in patches:

Imbricated Snout Beetle (Epicærus imbricatus). Fig. 72.



Fig. 70. Tunnels under bark made by Scolytus beetle.



Fig. 72. Imbricated Snout-beetle.



Fig. 73. Cacœcia rosaceana moth; wings open and closed.

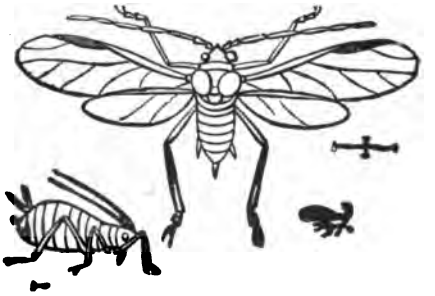


Fig. 71. Apple Aphis.



Fig. 74. Cacœcia rosaceana chrysalis and caterpillar, magnified.

C. *Attacking the Buds*:

a. Folding together the opening leaves and feeding within.

Oblique Banded Leaf-Roller (Cacœcia rosaceana), Figs, 73 and 74, and *Leaf Crumpler* (Phycis indiginella). Fig. 75.

b. Eating the centre of the bud, or tunnelling it.

Eye Spotted Bud-Moth (Tmetocera ocellana).

c. Measuring Worms—eating leaves of buds.

Canker-Worms (Anisopteryx pometaria).

d. Caterpillars feeding within pistol-shaped cases, and eating irregular holes in the bud leaves. *Pistol-Case Bearer* (Coleophora malivorella). Fig. 76.

e. Caterpillars feeding within cigar-shaped cases, and eating small round holes in the bud leaves. *Cigar-Case Bearer* (Coleophora Fletcherella).

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D. *Attacking the Leaves* :

a. Gregarious caterpillars.

1. Caterpillars protected by webs—

a. Webs in forks of branches in spring.

Tent Caterpillar (Clisiocampa Americana). Fig. 77.

b. Webs covering the leaves in summer and early autumn.

Fall Web-Worm (Hyphantria cunea).

c. Leaves partly eaten and drawn together by a web.

Palmer Worm (Ypsolophus pomotellus).

2. Caterpillars not protected by a web :

a. Clustered on limbs.

Yellow-necked Caterpillar (Datana ministra).

b. *Red-Humped Apple-Tree Caterpillar* (Oedemasia concinna). Fig. 78.

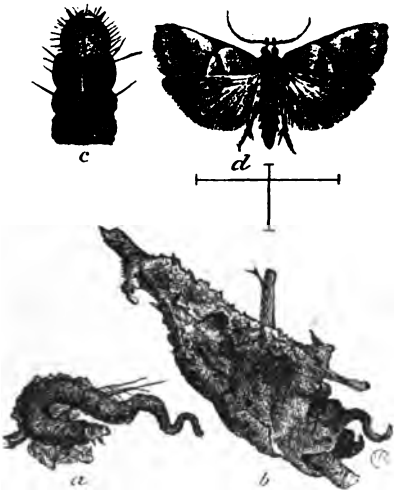


Fig. 75. Leaf crumpler : (*a*) and (*b*) winter cases ; (*c*) head of caterpillar ; (*d*) moth.

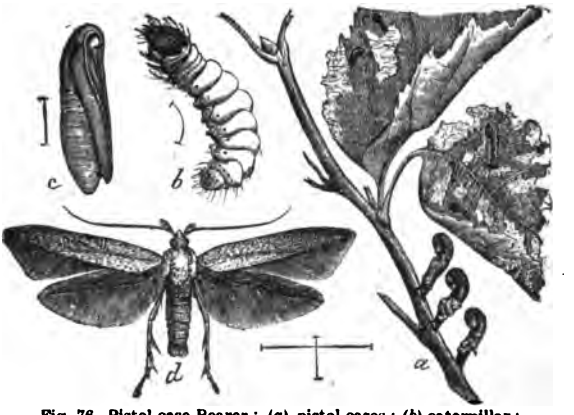


Fig. 76. Pistol-case Bearer : (*a*) pistol-cases ; (*b*) caterpillar ; (*c*) pupa ; (*d*) moth.

3. Green soft-bodied insects, with sucking mouths.

Plant Lice (Aphis spp). Fig. 79.

b. Solitary Caterpillars :

1. Protected caterpillars—

a. Mining within the leaf, pupa inside of folded leaf.

Apple-leaf Miner (Tischeria malifoliella).

b. Mining within the leaf, mature larva and pupa within small oval seed-like bodies.

Resplendent Shield Bearer (Aspidisca splendoriferella). Fig. 80.

c. Feeding within pistol-shaped cases which stand out from the leaf.

Pistol-Case Bearer (Coleophora malivorella).

d. Feeding within cigar-shaped cases, which stand out from the leaf.

Cigar-Case Bearer (Coleophora Fletcherella).

e. Feeding within folded leaves.

Leaf-Roller (Teras malivorana) and (Cacoecia rosaceana).

f. Feeding within tubes of silk, open at both ends, on epidermis and inner tissues leaving the veinlets.

Bud-Moth (Tmetocera ocellana).

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g. **Feeding on tissues of leaves beneath a silk web.**
***Apple-leaf Skeletonizer* (Pempelia Hammondi). Fig. 81.**

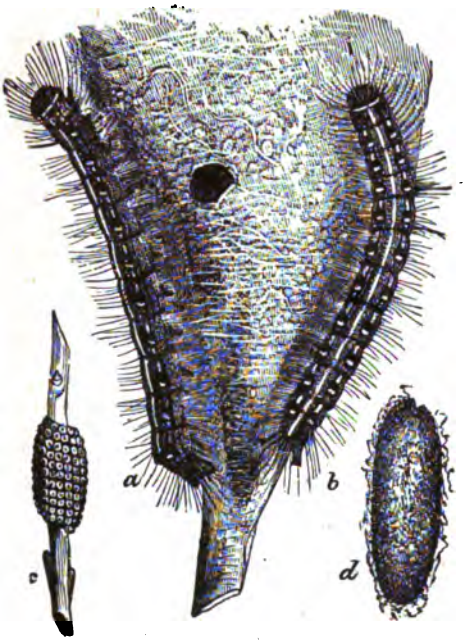


Fig. 77. Caterpillar (*a*) and (*b*) on their web ; (*c*) egg-cluster (*d*) cocoon.



Fig. 78. Red-humped Apple-tree Caterpillar.



Fig. 79. Aphis, wingless female, immensely magnified.

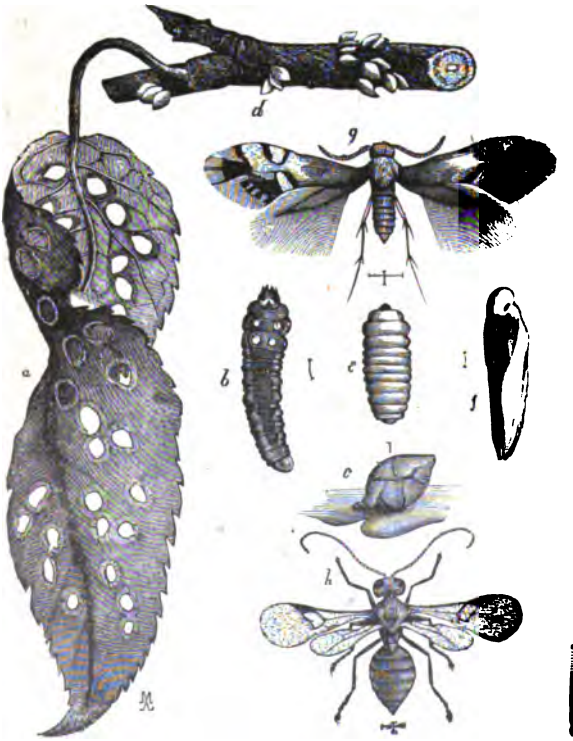


Fig. 80. Aspidisca splendoriferella : (*a*) leaf showing mines ; (*b*) caterpillar ; (*c*) and (*d*) pupal cases ; (*e*) larva about to change ; (*f*) chrysalis ; (*g*) moth ; (*h*) parasite—all except leaf and twig highly magnified.

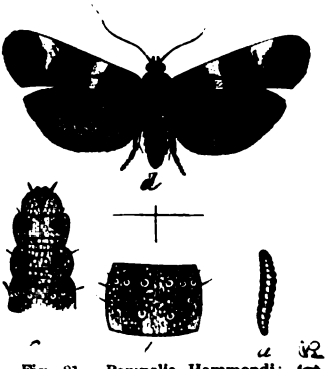


Fig. 81. Pempelia Hammondi: (*a*) caterpillar ; (*b*) a segment (*c*) head, and following segments highly magnified ; (*d*) moth.



Fig. 82. Cut-worm and Moth.

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2. *Unprotected Caterpillars* :

a. Measuring worms, in spring feeding in the day-time.

Canker Worms (Anisopteryx pometaria and A. vernata). Fig. 83.

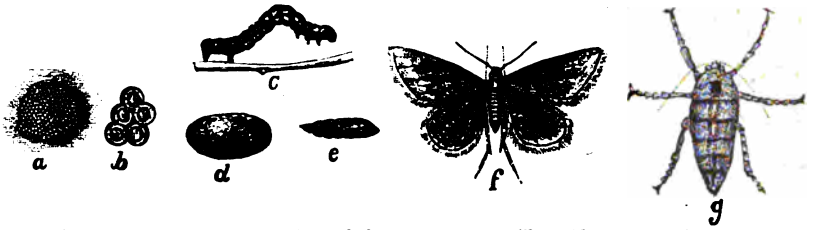


Fig. 83. Spring Canker-worm (A. vernata) : (*a*) and (*b*) eggs ; (*c*) caterpillar ; (*d*) cocoon ; (*e*) pupa ; *f* male moth (*g*) wingless female moth.

b. Sleek 16-legged caterpillars, feeding at night.

Cutworms. Fig. 82.

c. Large, green caterpillar, covered with spiny tubercles.

Cecropia Moth (Samia cecropia). Fig. 84.

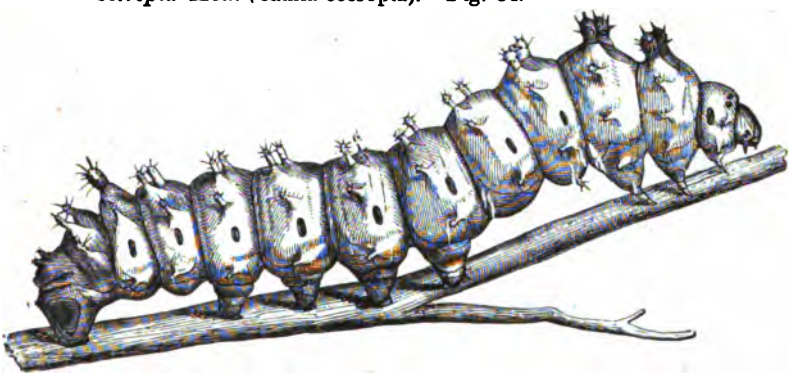


Fig. 84. Cecropia caterpillar.

d. Large apple-green caterpillar, with white oblique stripes on sides.

Polyphemus Moth (Telea polyphemus).

e. Hairy caterpillar with long black tufts over head and tail.

Tussock Moth (Orgyia leucostigma).

f. Large green caterpillar with a reddish-brown horn at tail, and seven oblique stripes on each side.

Apple Sphinx (Sphinx gordius). Fig. 85.



Fig. 85. Sphinx gordius.

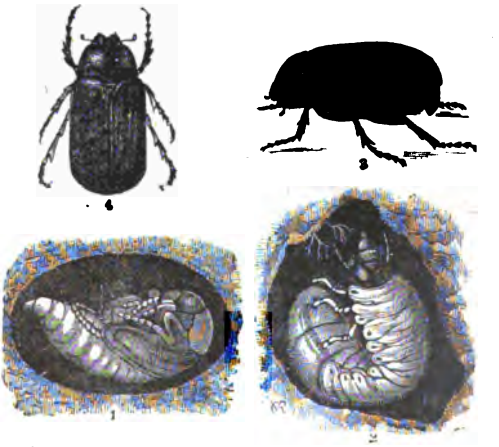


Fig. 87. May beetles : *1* pupa ; *2* grub ; *3* & *4* beetles.

g. Small caterpillar, with brown head and yellowish-green body, feeding on leaves.

Apple-Tree Bucculatrix (Bucculatrix pomifoliella).

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3. *Beetles* :

a. Large brown beetle feeding at night on leaves.

May-beetle (Lachnosterna fusca). Fig. 87.

b. Small brown beetles, feeding at night.

Leaf-beetles.

E. *Attacking the Fruit* :

a. Boring tunnels through the fruit—

1. Tunnels mostly about the core,—brown excrement often visible at opening at blossom end of apple :

Codling Moth. (Carpocapsa pomonella).

2. Tunnels irregular and numerous,—

Apple Maggot. (Trypeta pomonella).

b. Puncturing the Fruit :

1. Puncturing the fruit and distorting it, a 4-humped beetle,—

Apple Curculio. (Anthonomus quadrigibbus).

2. Purplish spots about the circular scales,—

San José scale. (Aspidiotus perniciosus).

c. Eating holes in the Fruit :

1. Large light-yellow or apple-green caterpillars with a narrow cream-colored stripe along middle of the back,—

Green-fruit Worms. (Xylina sp.,).

2. Beetle, yellowish, hairy, ½ inch long,—

Bumble-flower-beetle. (Euphoria inda), Fig. 88.



Fig. 88. Bumble-flour beetle.

WINTER CONDITIONS OF SOME OF THE APPLE INSECTS.

A. *Attached to trunk, branches, and twigs* :

1. White cocoons ½ to ¾ inch long, under loose bark, or burlap, during fall and winter,—

Codling Moth. (Carpocapsa pomonella).

2. Bracelets of varnished eggs around twigs in fall and winter,—

Tent Caterpillar. (Clisiocampa Americana). Fig. 77 (*c*).

3. Clusters of cylindrical eggs on branches and twigs in winter,—

Fall Cankerworm. (Anisopteryx pometaria).

4. Clusters of round, ribbed eggs,—

Cutworms.

5. Small, oval, shining, black eggs, usually clustered in axils of buds, in crevices, or under bark of upper branches and twigs, in winter,—

Apple Aphis. (Aphis mali).



Fig. 89. Leaf-crumpler : Winter cases covered with withered leaves.

6. Minute pistol-shaped cases on bark in winter,—

Pistol-Case-Bearer. (Coleophora malivorella).

7. Minute cigar-shaped cases on bark in winter,—

Cigar-Case-Bearer. (Coleophora Fletcherella).

8. Clusters of glistening oval cases on twigs in winter,—

Resplendent-Case-Bearer. (Aspidisca splendoriferella).

9. Minute silken cocoons at axils of buds, and in crevices of bark,—

Bud Moth. (Tmetocera ocellana).

10. Black, crumpled leaves folded together and fastened to the branches during winter—half-grown caterpillars in tortuous tubes within,—

Leaf Crumpler. (Phycis indiginella). Fig. 89.

11. Large silken cocoons, 3 inches long firmly attached to twigs during winter,—
Cecropia Moth. (Samia cecropia), Fig. 90.



Fig. 90. Cocoon of the Cecropia moth.

12. Elongated white, ribbed cocoons, ½ inch long, on twigs during winter,—
Apple Leaf Bucculatrix. (B. pomifoliella).
13. Mussel-shaped scales with whitish eggs underneath in winter,—
Oyster Shell Bark-Louse. (Mytilaspis pomorum).
14. Whitish scales with purple eggs underneath in winter,—
Scurfy Bark-Louse. (Chionaspis furfurus).
15. Minute black circular scales with a depressed ring about a central nipple,—
San José scale. (Aspidiotus perniciosus).
16. A mass of eggs on a cocoon fastened to a dead leaf or a twig in winter,—
Tussock Moth. (Orgyia leucostigma).
17. Eggs in oval slits,—
Buffalo Tree-Hopper. (Ceresa bubalus).

A Key to Plum Insects.

A. *Attacking the Roots* :
1. Burrowing about the crown of the roots, occasionally in young trees,—
Peach-tree Borer. (Sannina exitiosa).

B. *Attacking the Trunk, Branches, and Twigs* :
1. Making tunnels in the wood ; saw-dust-like excrement at the mouth of unnels,—
Flat-headed Borer. (Chrysobothris femorata).
2. Making tunnels in the bark :
Fruit Bark Beetle. (Scolytus rugulosus).
3. Bases of buds perforated, the bark becomes discolored, and the leaves and fruit wither,—
Pear-Blight Beetle. (Xyleborus pyri).
4. *Fixed to Bark* :
a Flat, or saddle-shaped, or hemispherical dark brown scales. Large scales after mid-summer are brittle and contain only a whitish dust or empty egg-shells. Wintering forms are small and flattish,—
Plum Lecanium. (Lecanium cerasifex).
b Ashy gray appearance of bark of badly infested trees ; small gray, or black circular scales,—
San José scale. (Aspidiotus perniciosus).
c Mussel-shaped scales, with whitish eggs underneath in winter,—
Oyster-Shell Bark Louse. (Mytilaspis pomorum).
d. Bark scurfy with white scales, purplish eggs underneath in winter.
Scurfy Bark-Louse (Chionaspis furfurus).

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5. Producing longitudinal slits and eventually oval-shaped scars.
Buffalo Tree-Hopper (Ceresa bubalus).

C. *Attacking the Leaves* :

1. *Feeding in Colonies* :

a. Protected by webs in the forks of branches.
American Tent Caterpillar, (Clisiocampa Americana).

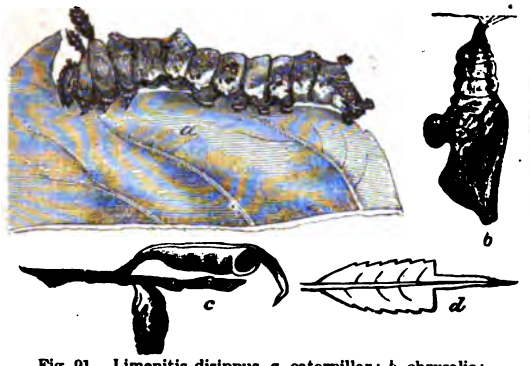


Fig. 91. Limenitis disippus, *a.* caterpillar ; *b.* chrysalis ; *c. d.* larval case.



Fig. 92. *L.* disippus butterfly ; colours orange-red and black.

b. Protected by webs covering the leaves.
Fall Web-worm (Hyphantria cunea).

c. Not protected by webs, greenish lice with sucking mouths.
Plum Leaf Aphis (Aphis prunifolii).

2. *Solitary* :

a. Measuring worms feeding in the day time and in spring.
Canker worms (Anisopteryx pometaria).



Fig. 93. Plum Curculio attacking young fruit ; 3 crescent mark ; 4 beetle puncturing fruit.

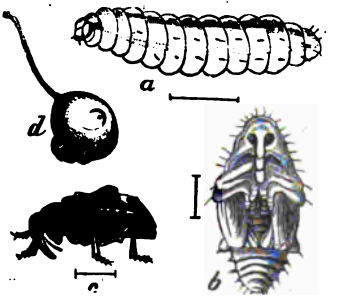


Fig. 94. Plum Curculio : *a.* larva ; *b.* pupa ; *c.* beetle ; *d.* natural size on young fruit.



Fig. 95. Plum Gouger (magnified).



Fig. 96. Rosechafer.

b. Fat, greasy caterpillars, feeding at night in spring.
Cutworms.

c. Hairy Caterpillar, with long black plumes over head and tail.
Tussock Moth (Orgyia leucostigma).

d. Large buzzing beetle.
June Bug (Lachnosterna fusca).

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e. Large apple-green caterpillar, with a tail horn, and with seven broad, oblique white stripes along each side.

Plum Tree Sphinx (Sphinx drupiferarum).

Other larvae are occasionally found feeding on the leaves of plum :

The Viceroy (Limenitis disippus), figs. 91 and 92, Polyphemus and Cecropia.

D. *Attacking the Fruit* :

1. Puncturing and making a crescent-shaped slit in the skin of the young fruit, which soon drops.

Plum Curculio (Conotrachelus nenuphar) figs. 93 and 94.

2. Making a round hole in the young fruit.

Plum Gouger (Coccotorus scutellaris) Fig. 95.

3. Eating holes in the ripe fruit.

Bumble Flower Beetle (Euphoria inda).

4. Eating holes in the half ripe fruit.

Rose Chafer (Macrodactylus subspinosus), Fig 96.

KEY TO PEAR INSECTS.

A. *Attacking the Root* :

1. Large yellowish-white borer, with a brown head, boring holes in the roots.

Broad necked Prionus (Prionus laticollis), Fig. 97.

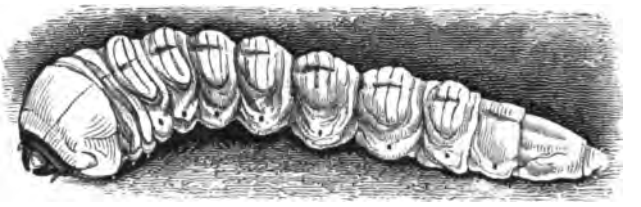


Fig. 97. Prionus laticollis grub.

B. *Attacking the Trunk, Branches, and Twigs* :

1. The following insects which attack apple (which see) also attack pear.

Round Headed Apple-Tree Borer (Saperda candida).

Flat Headed Apple-Tree Borer (Chrysobothris femorata).

Oyster Shell Bark-Louse (Mytilaspis pomorum).

Scurfy Bark-Louse (Chionaspis furfurus).

San José Scale (Aspidiotus perniciosus).

2. Large soft whitish larvae boring deeply into the wood.

Pigeon Tremex (Tremex columba).

3. In the Spring (May) much honey dew at axils of leaves on smaller twigs, and small yellow jumping insects in the sap, foliage yellowish.

Pear-Tree Psylla (Psylla pyricola).

4. Perforations at the base of some buds ; twigs blighted and leaves withered about mid-summer.

Pear-Blight Beetle (Xyleborus pyri).

C. *Attacking the Buds* :

1. The following insects which attack the buds of the apple (which see) also attack those of pear.

Oblique Banded Leaf-Roller (Cacoecia rosaceana).

Eye Spotted Bud-Moth (Tmetocera ocellana).

Canker Worms (Anisopteryx pometaria).

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D. *Attaking the Leaves* :

1. A slug-like, slimy larva feeding in July and September on the tissues of the upper side of the leaves.

   Pear Tree Slug (Eriocampa cerasi).

2. "Reddish blister spots 1-8 inch or more in diameter appearing on leaves in spring, and changing to black corky spots in July, each with a minute opening in it."

   Pear Leaf Blister (Phytoptus pyri).

2. The following insects which feed on the leaves of apple (which see) also feed on the leaves of pear.

   Red-Humped Apple-Tree Caterpillar (Oedemasia concinna).
   Fall Web-Worm (Hyphantria cunea).
   Tent Caterpillar (Clisiocampa).
   Yellow necked Caterpillar (Datana ministra).
   Canker Worms (Anisopteryx).
   Bud Moth (Tmetocera ocellana).
   Tussock Moth (Orgyia leucostigma).
   Cecropia Moth (Samia cecropia).
   June Beetle (Lachnosterna fusca).
   Goldsmith Beetle (Cotalpa lanigera).

E. *Attacking the Fruit* :

The following insects, which attack the apple and plum (which see) also attack the pear.

Codling Moth (Carpocapsa pomonella).
Plum Curculio (Conotrachelus nenuphar).
Bumble-Flower Beetle (Euphoria inda).

KEY TO CHERRY INSECTS.

A. *Attacking the Root* :

1. Thick whitish grub, with brown head and legs, feeding in decaying roots. Beetle large with powerful mandibles.

   Stag-Beetle (Lucanus dama), Figs. 98 and 99.

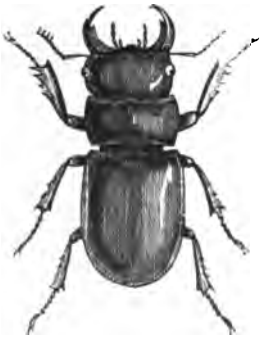


Fig. 98. Stag-beetle.

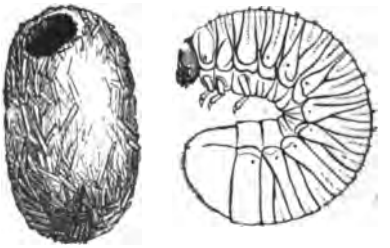


Fig. 99. Stag-beetle, cocoon and larva.



Fig. 100. Apple Twig-borer.

2. Large white fleshy grub, with reddish head, feeding in old roots.

   Rough Osmoderma (Osmoderma scabra).

B. *Attacking the Trunk, Branches and Twigs* :

1. A snout-beetle, gnawing the twigs and fruit.

   Imbricated Snout-Beetle (Epicaerus imbricatus).

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2. A small beetle boring into the branches just above a bud, and burrowing downwards.
Apple-Twig-Borer (Amphicerus bicaudatus), Figs. 100, 101.

3. A flattened grub tunneling in the bark and sap-wood; beetle bronzy metallic.
Divaricated Buprestis (Dicerca divaricata).

4. Large sucking insect with transparent wings inflicting wounds on the smaller limbs, and depositing eggs therein, in August and September.
Dog-day Cicada (Cicada tibicen).

5. Small circular scales, black in winter, with a circular depression about a central nipple.
San José scale (Aspidiotus perniciosus).

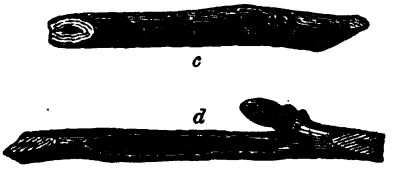


Fig. 101. Twigs showing work of Borer.

Attacking the Leaves:

1. A small beetle feeding on the leaves of red cherry.
Cherry-Leaf Beetle (Galerucella clavicollis).

2. A slug, shiny, dark-green, ½-inch long, feeding on soft tissues leaving the veins.
Pear or Cherry Slug (Eriocampa cerasi.)

3. Shining black plant-lice, infesting the terminal twigs chiefly, which become distorted and discolored.
Cherry Aphis (Myzus cerasi).



Fig. 102.
Callosamia promethea caterpillar.

4. Large bluish-green caterpillar, 2 inches long, with blue warts on each segment, and coral-red ones on 3rd and 4th segments.
Promethea Moth (Callosamia promethea), Fig. 102.

5. Large pale-green spiny caterpillar, striped on each each side with white and lilac.
Io Moth (Hyperchiria Io).

6. Caterpillars in colonies protected by webs in forks of branches, in spring.
American Tent Caterpillar (Clisiocampa Americana), and *Forest Tent Caterpillar* (not in webs).

7. Caterpillars in colonies not protected by webs covering the leaves in summer and early autumn.
Fall Web-Worm (Hyphantria cunea).
And other insects, most of which also attack the leaves of apple.

D. *Attacking the Fruit*:

1. Making a crescent cut on the cherry; grub, white and footless, with a brownish horny head, feeding within. *Plum Curculio* (Conotrachelus nenuphar).

2. Yellowish white maggots feeding on the pulpy juices near the pit, inducing a rotting. (Cornell Bull. 172).
Cherry Frit Fly (Rhagoletis cingulata).

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Key to Peach Insects.

A. *Attacking the Root and Lower Trunk* :

1. Tunneling in the bark and sap-wood of the root, causing an exudation of gum, which is seen at base of tree mingled with the castings.

   Peach Tree Borer (Sannina exitiosa).

B. *Attacking the Trunk and Branches* :

1. In early spring, a minute caterpillar bores into the shoots of new leaves, killing the growing terminals.

   Peach Twig-Borer (Anarsia lineatella).

2. Black hemispherical scales attached to the bark.

   Peach Tree Lecanium (Lecanium persicæ).

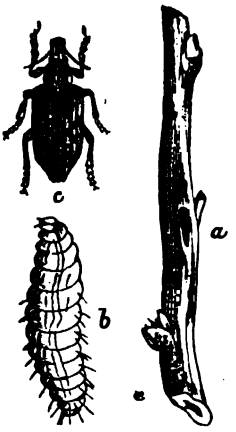


Fig. 103, New York Weevil.
a. Hole in twig made by female.
b. Larva ; *c*. Beetle.

3. A beetle eating the buds, and gnawing into the base of the twigs, causing them to break and fall.

   New York Weevil (Ithycerus noveboracensis), Fig. 103.

4. Round scales, gray or black, twigs presenting a scurfy appearance.

   San José scale (Aspidiotus perniciosus).

5. Oval scars and longitudinal slits on back.

   Buffalo Tree-Hopper (Ceresa bubalus).

C. *Attacking the Leaves* :

1. Plant lice, living in colonies under the leaves, causing them to thicken and curl.

   Peach-Tree Aphis (Myzus persicae).

2. Minute round scales, usually along the veins.

   San José scale (Aspidiotus perniciosus).

3. *Caterpillars protected.*

   a. In a tortuous tube.

   Leaf Crumpler (Phycis indiginella).

   b. In folded leaves.

   Oblique banded Leaf-Roller (Cacoecia rosaceana).

D. *Attacking the Fruit* :

1. Long legged, yellowish beetles eating holes in half-grown peaches.

   Rose-chafer (Macrodactylus subspinosus).

2. Large yellow hairy beetles, eating holes in ripe peaches.

   Bumble-flower Beetle (Euphoria inda).

3. Small snout-beetles making a puncture and crescent in the young fruit.

   Plum Curculio (Conotrachelus nenuphar).

NOTE ON INSECTS INJURIOUS TO PINES.

By W. Hague Harrington, F.R.S.C., Ottawa.

One of the features of Canada is the great forest belt which covers so large a portion of it, and which yields annually so important a revenue to its inhabitants. This magnificent forest stretches far inland from either ocean and northward forms an uninterrupted zone across the continent. Among the conifers which constitute so large a portion of this great forest area the various pines are prominent, and in the past they have been the chief source of wealth to our lumbermen who have already cut them over large areas. For many years I have seen each

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summer the rafts of white pine floating down the Ottawa, while the output of sawn lumber along the river has mounted annually into the hundreds of millions of feet.* On all our eastern rivers the same thing has been seen to a greater or less degree. The constant stream of logs coming down all the tributaries has testified to the richness of the limits upon which they are cut. Not to quantity alone do the pines owe their value, the wood of their splendid trunks is surpassed by that of few other trees in general utility. More than one-third of all our forest exports are the produce of the pines, from the sale of which we derive annually several millions of dollars, in addition to all that is used for home consumption.

So lofty and noble are these splendid lords of the forest that it might be thought that they are secure from all foes except the devastating axe and cruel fire. Yet few of our trees are attacked by so many enemies; small and individually insignificant, but occurring in such abundance sometimes as even to destroy and overthrow the forest giants. To enumerate all these would be beyond the scope and bounds of a paper for this report. One hundred species of insects injurious to pine were mentioned in Bulletin 7 of the U.S. Entomological Commission published in 1881, while in the Fifth Report of the Commission (1890) the number was increased to one hundred and seventy, requiring for their discussion, even briefly, one hundred and thirty-six pages. Mr. A. D. Hopkins has also enumerated many species in his valuable "Report on Investigations to Determine the Cause of Unhealthy Conditions of the Spruce and Pine from 1880-1893;" Bulletin 56 West Virginia Agric. Exp. Sta., April, 1899.

My intention in this note is only to call attention to some of the principal species which I have observed myself as infesting these trees, omitting the lepidoptera, of which various species feed upon the foliage, and also a great many members of other orders which do more or less injury. To the trunk and branches the most serious injuries are done by beetles, which belong chiefly to the families Buprestidæ and Cerambycidæ. The beetles of the first family are somewhat flattened and elongated, with short antennæ, and generally are very hard and with a metallic lustre or bright colours. Some of the most gorgeous of all coleoptera are found among the tropical representatives of this family. The larvæ of these beetles are somewhat tadpole-shaped and flattened, and are very destructive to the trees they infest. Fig. 104.

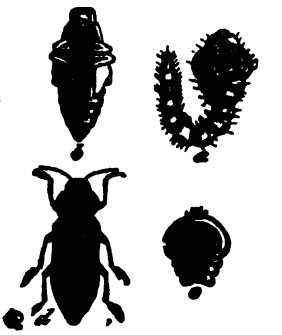


Fig. 104.—Flat-headed Borer (Buprestidæ). *a* and *c*, grub; *b*, pupa; *d*, beetle.

The three largest species upon pine belong to the genus Chalcophora, viz., *C. fortis* Lec., *C. Virginiensis* Drury and *C. liberta*, Germ. All these occur in abundance in spring and autumn either upon the trunk and branches, or in the leaf clusters, where they appear to feed upon the buds. *C. fortis* is the largest species, measuring over an inch in length, and is distinguished by its brighter colour and the more sharply elevated lines upon the wing-covers; *virginiensis* is slightly smaller and smoother, and is duller in colour, while *liberta* is generally still smaller and is more ruddy in appearance, although some individuals may be quite dark. Other species of buprestidæ are *Dicerca tenebrosa*, Kirby, *D. divaricata* Say (Fig. 105) *Chrysobothris dentipes* Germ., *C. Blanchardi* Horn, *C. Barrisii* Hentz, *C. trinervia* Kirby, *C. scabripennis* L. & G., *Buprestis striata* Fab., *B. maculiventris* Say, *B. consularis*, Gory, and *Melanophila longipes*, Say. On our Pacific coast the genus Chalcophora does not appear to be represented, but members of the other genera are common.



Fig. 105.—Dicerca divaricata beetle.

The second group of injurious timber beetles is that of the Cerambycidæ or long-horned beetles; the antennae, especially in the males, being often much longer than the body. The

* The quantity sawn during 1902 in the Ottawa district has been published as 620,000,000 feet.

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larvæ of these beetles are generally not quite so much flattened as are those of the Buprestids, but their habits are much the same. The eggs are placed in the bark in crevices or punctures made by the female, and the larva when hatched bores at first in the bark, then reaching the outer layers of the wood it feeds upon them, and gradually as it increases in size it works deeper into the solid wood. The largest and one of the commonest of our pine-boring beetles is *Monohammus confusor*, Kirby, a grey beetle with very long antennæ (Fig. 106). Its larva, when full grown, is about an inch and a half long, and is armed with a powerful pair of mandibles with which it eats its way rapidly through the wood. Standing near a pile of infested sawlogs one can distinctly hear the *crunch, crunch,* of the destroying grubs. This species occurs from the Atlantic to the Pacific and varies little in appearance. Another common species is *M. scutellatus*, Say, (Fig. 107)—a black beetle, with slight white markings which are often nearly rubbed off. It has also a wide distribution, but the western specimens vary slightly in appearance and were described as a separate species (*M. oregonensis* Lec) Other species of the genus are *M. tittilator* Fab., *M. maculosus*, Hald. and *M. marmorator*, Kirby, all found in Canada in greater or less abundance in different localities. These five species often cause considerable loss to our lumbermen, by their depredations upon sawlogs. Logs left in the woods for a year, through breaking up of roads, or lack of water, etc., are often so badly damaged as to greatly lessen their value. This damage can be prevented by removing the bark from the logs in spring, but this means a considerable expense, even when practicable. Other long-horned beetles infesting the pines are *Tragosoma Harrisii*, Lec., *Asemum mœstum* Hald. (Fig. 108), *Criocephalus agrestis*, Kirby, *Rhagium lineatum*, Oliv., etc.

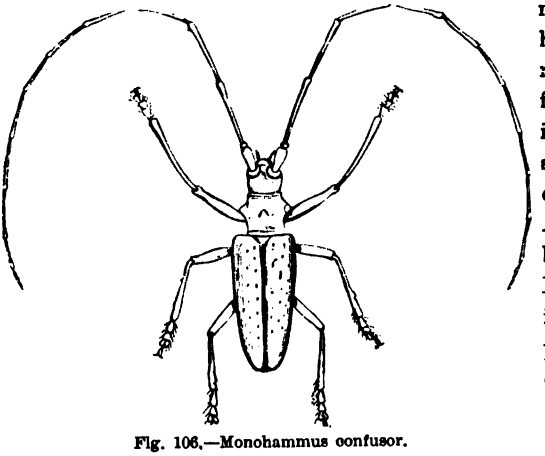


Fig. 106.—Monohammus confusor.

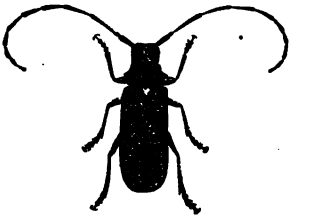


Fig. 107.—Monohammus scutellatus.



Fig. 108. Asemum mœstum.

Another group of destructive beetles is the Scolytidæ. These are quite small insects ; the largest scarcely over one-quarter of an inch long, and some very minute. They are, however, exceedingly destructive, as they occur in great numbers, and attack both injured and healthy trees, some species boring even into the bark of young trees. The mother beetle tunnels a groove an inch or more long under the bark, and inserts eggs at intervals. The larvæ, when hatched, eat outward in all directions, producing in some instances quite regular and effective patterns radiating from the parent burrow. Each colony loosens a portion of bark of several square inches, and when, as is often the case, the colonies are in close proximity to one another, the bark is loosened over large areas of the tree's surface and the sap layers of the wood are destroyed, thus causing the death of the tree. Among common species may be mentioned, *Pityophthorus sparsus*, Lec., *Tomicus pini*, Say, *Dendroctonus terebrans*, Lec., and *Hylurgops glabratus*, Zett.

There are also several destructive beetles belonging to the Rhyncophora (snout-beetles or weevils), which occur abundantly. The most important of these belong to the genera Hylobius and Pissodes, and are very common about millyards as well as upon the pine trees. *H. pales*,

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Hbst. and *H. confusus*, Kirby, infest the trunks and limbs, boring under the bark and through the outer wood layers. *P. strobi*, Peck, infests the young shoots, in which the eggs are placed at intervals, and in the pith of which the grubs burrow, causing the shoots to die and wither. The terminal shoot is frequently affected, thus checking the upward growth of the tree, and causing it to become forked, or to have a crook in the trunk. *P. affinis*, Rand., is another common species.

Besides all the beetles that infest the trunk, branches and twigs, there are many insects preying upon the foliage. They include the caterpillars of various moths, and the young of several bugs, known as spittle-insects, also beetles, plant-lice, etc. Several sawflies belonging to Lophyrus and Lyda live upon the pine leaves, and sometimes occur in such numbers as to seriously defoliate them. A kind of gall, or swelling of the twigs is formed upon the red pine by the larva of a little snout-beetle, *Podapion gallicola*, Riley, and the cones of both red and white pines are infested by the larvæ of a scolytid, *Pityophthorus coniperda*, Schwartz, which cause them to become aborted and prevent the development of the seeds.

Mention has been made of only a small number of the insects infesting our valuable pines, and in the briefest way, but even these few notes will indicate the great number of enemies they possess, and the vast amount of injury which is effected in the aggregate, by these individually insignificant little foes.

A TALK ABOUT ENTOMOLOGY.

By J. Alston Moffat, London, Ont.

It has been said by a wag, "That Entomology is the science that gives to insects long names, short lives and a pin through the middle." That bit of humour with its absence of correct information, its jocular misrepresentation, and its implied disparagement of the subject, reflects, fairly well, the condescending attitude assumed towards it, by the great majority of every community, who seem to regard it as the frivolous pastime of a few harmless lunatics, that might be better employed, but who are yet more to be pitied than blamed. Such being the common view of entomology entertained by the multitude, it is not surprising that so few should be found willing to turn their attention to it, either as a science, or for its economic bearing on the prosperity of the community, or as a recreation. Indeed, it requires a firm conviction of its value and importance in the world by those engaged in it, or the great pleasure derived from a study of it which it brings to themselves, to make them willing to endure the faintly disguised wonder and disdain they are exposed to. Many a youth with a fine appreciation of the beauty of insects has been driven from following out his inclinations by the jibes and jeers of his less favored companions.

The ever-ready excuse for avoiding entomology as a subject of earnest consideration, is the long names in a language they do not understand. That will be no obstacle in the way of anyone really desirous of understanding the subject. Names are a necessity. The design of names is to distinguish between things that differ. The value of scientific names is that they are all in unchanging language that makes them uniform the world over, regardless of what the vernacular may be. Such a condition is necessary for the systematic arrangement and classification of the objects named, without which science could not exist. The name of any object in any language must be learned before it can be known and remembered. But once the object and its name are associated together in the mind, all difficulty with the matter vanishes, and it matters comparatively little what the name may be, so long as the object is familiarly known by it. Its meaning, if it has one, will come in due time. What some seem to want to get is a name that will give them the size, form, colour and general appearance of the insect, so

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that they will know it when they see it, without having learned it—an impossibility in any language, especially where there is such a multitude of slightly differing forms as there is in entomology.

Great diversity has been, and is being displayed by describers in giving names to insects. Some have had the faculty of choosing names for their species that are short, pretty and appropriate. Others have so multiplied syllables in their names, as to make it difficult even for an expert to pronounce them; yet even with these a little familiarity makes it easy. Visiting at a friend's one evening, a lady and her daughter were present. The Walking-stick insect, *Diapheromera femorata*, was brought up in conversation. For their amusement, I went over the encyclopedic description of the creature. "Filiform and linear, entirely apterous, without elytra and destitute of stridulation." "Dutch," said the daughter. "Not at all; excellent English," said I. The mother, who had been attentively listening, and who understood German, remarked: "I knew it wasn't Dutch, but I didn't think it was English." So the trouble is really in unfamiliarity with the terms used, rather than in the language in which they are given. Some of the older heads in entomology are at present suffering great inconvenience from the changing of scientific names, in obedience to the demands of the law of priority, which is causing so much confusion, as to make them think that permanence in nomenclature, which gives opportunity for becoming familiar, is of far more importance than the names themselves. In this connection I copy the following paragraph from "The Introduction to the Report on *Ophiuroidea*," by Theodore Lyman. In the voyage of H. M. S. Challenger. (Vol. V, Page 6).

"In the description of this monograph, I have tried to use simple words as often as possible, and not to add to the jargon in which zoology is now smothering In addition to a gigantic classification, to form which the dead languages have been torn up and recomposed, there is an ever-growing crop of anatomical and embryological terms No callow *privat docent* but thinks he does good service in adding a score of obscure words to define his ephemeral theory. Doubtless he is not aware that his work has two faces. First, as regards himself, these new words of his have become familiar and convenient in a subject he has long studied. Secondly, as it regards his readers, not only have they never heard the new words, but have perhaps known the parts referred to by other names. They must, therefore, go through three painful processes: - (a) Commit to memory, with dreary labour, like sawdust-swallowing, the novel words. (b) Learn to what parts they apply. (c) Carefully forget the old terms."

"The result of this system has been, not a language, but a jargon, such as Moliére would scarcely have ventured to put in the mouths of the medical faculty in his Malade Imaginaire."

There are more than two hundred thousand different kinds of insects known, described and named even now, and the work is not yet nearly complete, so there are many new names yet to be got for new species. Then there are the varieties to cognominate; and in some instances these are numerous. In one case it takes sixty-two distinct names to label the species. And when we consider that duplicating of names is to be avoided, we get some insight to the difficulty of providing suitable names for such an host. The effect produced by those long and mysteriously high-sounding appellations upon people with vigorous imaginations is often quite surprising. They are inclined to picture to themselves a creature proportionately formidable to the name as it appears to them. Many amusing instances of this might be given.

On one occasion when exhibiting my collection at a fair, a young man with his female friend came along; but their tastes appeared to run in opposite directions. He called her attention to the butterflies, she said she could see butterflies any day. Then look at this grasshopper he persisted himself scrutinizing it closely. Seeing that he was an interested observer

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and wishing to detain him, I said, call that a grasshopper? 'Yes. What do you call it?' *Conocephalus ensiger*. There now, said the girl, you go home and see if there is anything like that about your place. Oh no, he replied. If there was, I would sell out and leave!

Being on a visit one evening to a place where some attention had been given to collecting, a *Polyphemus* cocoon was placed on the table to interest the company. A young man eyed it suspiciously, reached out towards it timidly, and as his fingers were coming in contact with it, I called, hah! which caused him to draw back suddenly. This raised a laugh at his expense, and he then prepared for an exhibition of boldness; when I remarked, "The man does not know the risk he is running." Turning to me in all seriousness he enquired: 'What is it anyway?' Confident in the ignorance of the company in regard to names, I said, 'Why it is a *Boletotherus cornutus*.' "Oh, bejove. I won't have anything to do with it then." And he didn't.

The accusation that entomologists shorten the lives of a few insects in the pursuit of their science is quite true. But this profession of sympathy for insects is usually made on behalf of some beautiful and seemingly harmless butterfly, overlooking the fact that the handsome creature may produce an offensive looking and destructive grub. I have yet to hear the first expression of regret for the death of a potato beetle, but I have heard a lady taking credit to herself for stepping on every one she saw on the pavement. And yet the lives of each are equally valuable to the owners thereof. Upon one occasion I secured a prize in a place of public resort, and was taken severely to task by an elderly lady, for my cruelty in depriving of life such a beautiful and harmless creature. I defended myself by asking a question: Suppose you saw a caterpillar crawling on your dress, what would you do with it? "Oh, the nasty thing. I would knock it off and put my foot on it." In so doing you would be taking the life of just such a beautiful creature as I did, only in a different form. That did not change her opinion of me. Thus, feelings are allowed to control reason and judgment. A poet has asked: What's a butterfly?" And answered: "At its best, 'tis but a caterpillar drest."

It is no unusual thing to hear individuals when looking at a case of butterflies, go into raptures over their beauty, and extol the marvellous works of the Creator; but when confronted by one of beetles, they will express their horror and disgust at what they regard as most objectionable creatures; and yet they were originated by the same inventor, and are products of the same workshop, and the one exhibits as much wisdom and beneficence in their construction, and as perfect an adaptation to their requirements in nature as the other. And our duty is to endeavour to discover and disclose wherein that lies, so that we may be able in some measure to give an answer to that oft repeated question: "What were insects made for anyway?"

When Topsy was asked "Who made her," she said she wasn't made, she grew; and in any correct use of language Topsy was right. Its a long while since any living thing was made in this world, and yet there was a time when no living creatures existed on this globe. Therefore, they must have been originated at some time, and in some way. And the accumulated evidence strongly vindicates the belief that they were originated by design, for a purpose. And ever since, those who have survived the fluctuations of time, have kept on propagating their kind in accordance with the laws of their being with which they were originally endowed. Moulded and modified in many ways by external conditions and altered circumstances, the better to fit them for performing their part in assisting to maintain the balance of nature. Man being, preëminently the disturber of harmony in this world.

As to the "Pins" which are so much in evidence in a collection of insects, they are a necessity for the handling of specimens without injury when under examination, as well as to carry labels and fix them firmly in place for future observation and study. Many observant persons when looking at a collection of insects, will express great surprise at the number of kinds therein displayed that they have never seen before, and wonder that it should be so. But it is just what might be expected, as a great many insects cannot be distinguished from

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one another when flying about. It is not until they are captured, killed, pinned and spread, that the difference between them can be discovered. Yet many people see nothing in the pins but an evidence of cruelty on the part of collectors. No intelligent collector of the present day would think of pinning an insect before killing it, when there are so many approved methods of giving them pleasantly and instantly everlasting sleep ; and thereby secure his specimens in perfect condition by preventing fluttering. Much misinformation prevails even amongst educated persons about the suffering of insects, which is not quite creditable to them. Suffering is the result of being possessed of a nervous organization. The more highly this organization is developed, the more sensitive to suffering is the creature possessing it. All creatures are not thus equally endowed, therefore all creatures are not equally liable to suffering. The human race is supposed to stand highest in this respect, and yet there are wide differences between individuals of it. A highly cultivated and refined woman is far more liable to suffering, mental and physical, than one who has been exposed to rough conditions all her life. Insects have a very low organized nervous system, and therefore are not, and cannot be, liable to acute suffering. Apart from the science of life in that respect, it has been abundantly demonstrated. As an illustration : A moth asleep in day time on the side of a tree, has had a pin passed through its body, and firmly fixed to the tree without disturbing its repose. It remained in that condition without showing signs of its discomfort until evening came, when it wanted to fly about, then it fluttered vigorously ; which might have been mistaken by an observer as an evidence of suffering, when it was only the result of its eager desire to indulge its nocturnal habit. I have cut half the abdomen off a mosquito that was feeding, and it did not injure its appetite in the slightest. But it is our nature to associate suffering with injury, therefore it should not be wantonly indulged in. Children especially should be taught to deal mercifully with every living creature, even a mosquito, and dispatch it as expeditiously as possible, to save others from suffering. But I have heard boys condemned as wicked and cruel when chasing and capturing butterflies, and peremptorily ordered to stop it, which was intended as a fine exhibition of tender consideration for the feelings of the insects, whilst it showed none whatever for those of the boys. Surely a boy is of more value than many insects. Sentimentalism, however lofty, is not edifying.

Man's prerogative in this world is to dominate nature, and make the powers of nature subservient to his advancement, and all modern progress and improvement in horticulture, agriculture and stock raising, is founded on the principles of man's ability to improve upon nature for his own benefit. But to accomplish that, man's work must be in harmony with the laws of nature, else disaster may follow. Nature when left to the operation of its own beneficient laws, succeeds in establishing and maintaining an exquisitely adjusted balance between the numerous conflicting elements in its own vast domain. But man in his eager desire for large profits and quick returns, thinks he can accomplish his ends by more direct methods ; ignorant of those finely adapted harmonies, he goes to work in his own way to bring them about, but often discovers to his sorrow, that he has started some of nature's machinery in motion that is working in an opposite direction to his intentions, and is threatening his ruin rather than his advancement ; so he has to call a halt, to reconsider his methods, and with patient labor, observation and research try to discover where he has gone wrong, what he has overlooked and how to do better. When Henry Ward Beecher undertook to be a farmer, he met with so many unforseen and unexpected hinderances to success, that it seemed to him as if all nature had joined in a league against him, and he was ready under the influence of such feelings to give that reply which raised such a storm against him at the time. When asked how to get rid of Canada-thistles, he said, "Cultivate them for the market. Then the bugs will attack them and the mildew will blast them. Then the grubs will eat their roots, and the caterpillars will devour their leaves. Their stocks will rot, and their blossoms fail to

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produce seed. The frost will cut them by night, and the sun will scorch them by day, and you will soon have no thistles." And this conflict between man and nature, is from his violation of the laws of nature, always going on; and will, until he more thoroughly understands nature's laws and how to obey them. And the more artificial man's methods become, the higher is the intelligence required to make them successful.

The community may be divided into the rural and the urban, or such as live and work in the country, and those that make their living in towns and cities. It is the products of the rural workers' labour that are most exposed to insect depredations; and, as a rule, it is they who give the least attention to such matters. The cause for this condition of things is not far to seek. The rural workers' labour and leisure are very unequally divided. Summer is short, and the work is pressing. The crops must be got in; and the crops must be got off. And during the process there is little time and less inclination to give attention to the operations of their insidious insect foes, that may be robbing them of half the profit of their labours. In the winter time they have the leisure to gain information, but it is not the season to put it in practice to any extent; so with the next summer's advent the usual rush begins, and their time as well as their inclination for that kind of work disappears, and their attention to the depredations of insects is put off to the future.

An idle man out for a stroll, and a delightful health-refreshing converse with nature, reached a projecting point of the Niagara escarpment, situated about four miles east of Hamilton, from which, on a clear day, Toronto can be seen. The landscape below, once lake bottom, but now dotted with human habitations that are surrounded by regularly laid out and well cultivated fields, orchards and vineyards, their dimensions reduced by distance, until they look like flower-beds in a well kept garden, with Lake Ontario shining bright and calm beyond. A prospect of charming loveliness. A woman came out of a harvest field near by, dressed suited to her work, but quite different from what she wore when he had met her in the city. She thought it necessary to apologize for her appearance, and kept it up to his discomfort. So to change the subject he remarked, "What a magnificent view you have from your place." The reply was, "Troth then and its much we care about the view, working like the slaves we are all the day." He could but bow to the justness of her rebuff, and ponder on its widespread and far-reaching applicability. No time—no inclination for such indulgence. Severe and continuous toil is not conducive to mental cultivation.

Amongst those that live and work in urban locations, where labour and leisure are more equally divided, there always have been some who were fascinated by the beauty of insects and their intensely interesting habits of life. Many of these in the pursuit of their favourite study have seen, realized and become impressed with the thought of what tremendous loss the rural workers are sustaining from the depredations of insects, and have persisted in calling attention to it, and urging that measures should be taken to prevent it. Their thoughtful consideration has not been without result. Governments, which have the interest of their country at heart, having had their attention called to the matter, and seeing that those most directly interested were, from want of time, knowledge or inclination, doing nothing, and that the whole community was suffering loss thereby, have taken hold of the matter, and are looking out for persons qualified in some measure by previous observation on the subject, and are appointing them to give their whole time and attention to that work. Such action is in perfect accord with the established principle of the division of labour for the attainment of the highest results with the least expenditure of time, money and labour. And the rural workers realizing the advantage of such an arrangement, will be willing to sustain the procedure, when they find it is profitable to have that done for them, which they may not have time or capacity to do for themselves; and the whole community will be benefited thereby. So now the time has come when attention to the work and ways of insects is getting acknowledged to be of real

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importance in the management of rural affairs, which cannot well be done without, and work in that line will become an established profession. Men being educated for it, and their services having been found to be profitable will soon become necessary, when they will be called for as regularly and paid for as willingly as those of any other profession. Thus entomology has vindicated its claim to recognition as a science useful and important to the community.

The educational authorities are now alive to the great advantage that would result to the whole community if it were in some measure informed upon natural history subjects, and to that end have placed them in the lesson course of schools. But it is doubtful if a more effectual method could be taken of turning children against natural history than by making it one of the tasks they have to learn, and which the most of them will look back upon with dislike, and be glad to have done with. Whereas, if they were encouraged to make natural history collections, themselves choosing the department, it would be in harmony with their natural inclination to collect something, and would at the same time form a safe outlet for their surplus energy, which would produce such an agreeable impression on their minds as to go with them in after-life and induce them to take it up again whenever opportunity presented itself. A consummation much to be desired and which may be realized when parents and teachers themselves have acquired a real love of the subjects.

Mankind is instinctively utilitarian, and this is reputed to be the most utilitarian age that has been. The disposition of the race is being intensified in the individual, by the tendency of the times in which he lives. So everything is tested by the standard of: How is he, or they, to be benefited thereby? and to what extent? But the great majority of mankind have no choice in life, they are controlled by necessity, the necessity of making a living. And this so occupies their attention that they have little time for anything else. But constant application of mind or body to one particular vocation becomes monotonous and depressing. So for the health of body and mind, relaxation is necessary. Many suppose that such is only to be obtained by an entire absence of occupation; this is a mistake, the most refreshing relaxation is often found in a mere change of occupation. The most tiresome day of many a man's life is a holiday; simply because he has nothing to do. Activity is conducive to happiness. Many who have been successful in business, and have got over the necessity of working for a living, yet remain in business, because they have no other way of pleasantly and profitably occupying their time. Now here comes in the immense advantage which those possessed of some knowledge of natural history subjects have over those with none. A means of healthful recreation is always within their reach. All they have to do is to open their eyes and they find objects of interest liberally strewed around them. So that, whether it be the weary toiler with only his tiresome holiday to spend, or the successful man who has got beyond the necessity for labour, and has much time to spare, they will find in it a never-failing means of profitably occupying whatever time they wish to give to it. When the eyes are opened to the beauties of nature, the pleasure of a walk or a drive is immeasurably enhanced by the ability to intelligently recognize the diverse objects that are constantly presenting themselves to view. The enjoyment of rest and repose in the shade on a hot summer's day, is quadrupled by observing the different forms of the trees, with their characteristic manner of growth; and the kind of birds and insects that frequent them. And to be able to distinguish them by name as recognized acquaintances, is a yet greater addition to the pleasures of life. One great advantage of taking recreation in the observation and consideration of natural history subjects is, that it requires no elaborate preparation to begin with. Every one is able to appreciate in some measure the beauties of nature and the faculty will increase and strengthen with exercise, so that all that is required of anyone is to begin to observe. Observation excites curiosity, curiosity leads to enquiry, enquiry tends to increase knowledge, and the more one knows, the more one desires to know. And natural history subjects are so diverse in their manifestations, as to provide something suited to

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every taste. Then they are not the monopoly of the rich or the learned, but are open to all who have an eye to see, and a mind to perceive. They are educational in their influences, leading to habits of thought, observation and self-control. They are elevating in their tendency, leading away from that which is base and ignoble, to that which is pure, beautiful and refining. Physically they are healthful; most departments requiring those out-of-door activities that brace and strengthen. And they are perfectly inexhaustible, and such a source of enjoyment, as only those engaged in them have the slightest conception of. Thus satisfying man's utilitarian disposition to the utmost.

In nothing of all that, does entomology fall short in interest and importance to any other department of natural history. There are four times as many different kinds of insects in the world as of all other kinds of animal life put together, and their powers of increase may be reckoned at fifty times as great. Then insects have four separate stages of existence to investigate before you can be certain that you have an exact knowledge of their life history. Whilst the simple question, "What constitutes a species," amongst them, remains as yet wholly unsettled. If it is the beauty of nature that attracts your attention, you will find in insects the equal of flowers, with the added charm of animation; combining in colour and form the highest art with the poetry of motion. It is the strange and wonderful that excites your interest; no where in nature can be seen such marvels as in the transformations of insects such departures from the ordinary course of life in other creatures; such contrasts in conditions; from the lowly and grovelling, nourished on garbage; to the elegant and refined, revelling in the sunbeam and sustained by nectar. In their individual instincts along the lines of natural capacity, excelling in correctness the most cultivated reason of man. In the perfect adaptation of parts to their uses, they are far in advance of the inventive powers of a human genius, and in many instances they exceed in grotesqueness, the imaginative creatures of the wildest romancer. And whilst they are considered to be the ephemeral things of a day, their pedigree can be traced to the remotest antiquity; and no where else can be found such beautiful illustrations of natural theology. Thus providing abundant scope for the exercise of every faculty of the human mind.

THE NORTH-WEST (CANADA) ENTOMOLOGICAL SOCIETY.

ANNUAL MEETING.

On Wednesday afternoon, Nov. 5, 1902, at the High school, Calgary, was held the fourth and last annual meeting of the North West Entomological Society. The meeting was one of very great interest, for it involved the extinction of the Entomological Society and the founding in its stead of the Territorial Natural History Society.

ENTOMOLOGICAL SOCIETY.

The chair was occupied, until the burial of the Entomological society, by the Right Revd., the Bishop of Saskatchewan and Calgary. The large room was crowded and among those present were Chas. W. Peterson, deputy commissioner of Agriculture, Regina; T. N. Willing, Regina; Dean Paget; Percy B. Gregson; N. D. Sanson, curator of Banff museum; F. H. Wolley-Dod; A. G. Wolley-Dod; C. Marker; Principal J. B. Boyce; Messrs. King, Tomlinson and about forty other residents of Calgary and district.

Letters in support of the meeting were received from the Mayor of Calgary and other gentlemen.

After an interesting opening speech by the chairman, Mr. Percy B. Gregson, as president of the Entomological Society, was called upon to address the meeting.

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PRESIDENT'S ADDRESS.

Mr. Gregson said that the Society was now in its fifth year of existence and explained some of the difficulties that had to be overcome in the course of its establishment. Very early in the society's existence, botany was made a complementary subject with entomology, and by constantly hammering away, holding meetings and by pointing out on every possible occasion the manner in which agriculture was affected by insects and plants, farmers were interested in the welfare of the society.

One difficulty to contend with has been, not so much the prejudice of the young people against insects, but the prejudice of the parents, which however was passing away. The president then proceeded to describe the formation and operation of one of his field clubs. At first two or three boys would join for the fun of the thing—perhaps one of them might be in earnest—and a girl or two. In the afternoon they would go out, and from the varied assortment of things taken (bugs, beetles, spiders, caterpillars, butterflies, etc.) a caterpillar obviously parasitised would be selected, and the circumstance and importance of it explained. Then perhaps on another occasion the attacks of a small fly on the common prairie aster would be noted, and the young people asked to find one free of attack. They would by that process learn how very few plants there were which had no insects of any kind attacking them. The membership of the Lacombe Field Club now numbers 22, all filled with a sense of responsibility as naturalists. Three out of four who have gained prizes this year are members of this field club, and these prizes were gained against a competition open to all the Territories.

There is now also being organized at the Red Deer school a field club for that district on the lines of the Lacombe Club, so that next year (if all is well) there will be two such clubs in full operation.

Speaking as to the use of the study of entomology, or botany, or any other subject of natural history, Mr. Gregson said that even looking at it as a hobby there is this value in a hobby, that of a definite purpose in view. But there are other uses. Botany is the study of the life history of all plants. It teaches us their modes of growth, habits, natures, localities, etc., so that we learn just how they affect the farmer for good or bad, and in the prize competitions for this year it was made a special condition that the collections should specify these particular features. Then take entomology. This means the study of the life history of all insects. It is not enough to simply know the names of the insects, though that is a good step forward, but their habits and life history from the time they hatch from the egg until they undergo their final change must be learnt as far as possible, and as we learn so our interest grows and our collections should show this life-history.

Another use of the study of natural history is the remarkable development it induces of the faculty of observation—in the young especially. It is extremely interesting to watch this development. About two years ago one of the young folk to whom Mr. Gregson is teaching entomology came to him and said: "Mr. Gregson, I shall never get a collection, there are so few insects." He was told to persevere, and this summer he said: "Mr. Gregson, there seem to be insects everywhere."

This is a young boy—a boy 12 years old—who has gained the first prize in entomology this year. His collection was handed around the room and excited much interest. Another is the love of nature which these studies cultivate—one of the most valuable possessions one can have, and it is well that this should be cultivated while we are young.

As an almost natural corollary with the work of the entomological society, plans have been formulated for the establishment of natural history museums at the schools of Red Deer and Lacombe, which the pupils are intended to collect for and augment every year. These museums

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are designed to include every subject of natural history (plants, insects, fossils, minerals and other geological specimens, birds, shells, etc.) a few cases for each school have already been ordered to be constructed as a start.

Such, then, is the history of the North West Entomological Society up to the present day.

Letters were then read from J. A. Calder, deputy commissioner of education, Regina ; Professor C. C. James, deputy minister of agriculture, Ontario ; H. H. Lyman, late president of the Ontario Entomological Society, etc., expressing the most favorable opinions with regard to the course adopted.

PRIZE WINNERS.

Mr. Gregson then announced the names of the winners of the prizes in Territorial competition for insects and plants. The winner of the prize of $2.50 (given by Dr. James Fletcher, Ottawa), for best collection of injurious and beneficial insects is Master D. Tipping, Blackfalds. The prize given by the society for best numerical collection of insects was won by Master Benjamin Howell, Lacombe. For best collection of plants, the prize of $2.50 (given by Dr. Fletcher) was won by Miss Lucy Howell, Lacombe ; and second prize (given by the Society) was won by Miss Mary McDonald, of Urquhart.

The balance sheet was then read, showing a deficit of $40. (A special donation of five dollars has since been received from Mr. H. H. Lyman of Montreal).

DISSOLUTION OF THE SOCIETY.

Mr. Gregson then stated that he had now arrived at one of the saddest episodes in the history of the Entomological Society, namely, its suicide. He proposed that the Entomological Society should be discontinued, and explained that this did not mean oblivion, for that from its ashes would arise, he trusted, a society with greater scope for work, on the lines of a natural history society for the Territories and on this basis he understood that the existing members would transfer their allegiance to the proposed new society.

Before proceeding with the new business, Principal Boyce expressed his desire to assist in the formation of a museum at Calgary and Mr. Tomlinson offered to help the young collectors and others in every way he was able towards that end, and Mr. Gregson promised his advice and cooperation.

Moved by T. N. Willing and seconded by C. W. Peterson, that a vote of thanks be extended to the officers of the Entomological Society for the energetic and untiring way in which the affairs of the Society have been conducted. This was carried.

Moved by Mr. Gregson, and seconded by Mr. A. G. Wolley-Dod that a vote of thanks be extended to the chairman, His Lordship the Bishop of Saskatchewan and Calgary.—Carried.

TERRITORIAL NATURAL HISTORY SOCIETY FORMED.

Moved by Mr. Gregson and seconded by Mr. A. G. Wolley-Dod that a new society be formed under the title "The Territorial Natural History Society" with fee of one dollar for Membership.—Carried.

The following are the objects which this society has been organized to carry out, viz :—

(a) To instruct farmers how to recognise beneficial and injurious insects, weeds and birds, and how to combat those that are injurious.

(b) To promote an interest in and the study of the economic and scientific phases of the various branches of Natural History.

(c) To establish one or more Natural History Museums at central points, and Collections in connection with Schools throughout the Territories.

Mr. Chas. W. Peterson was then elected to take the chair, with Mr. T. N. Willing as secretary pro tem. for the proceedings.

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Moved by Mr. N. B. Sanson, and seconded by Mr. F. H. Wolley-Dod that the Divisions of Entomology, Botany and Ornithology be at once established.—Carried.

A draft of the constitution of the Territorial Natural History Society was then considered section by section and finally the same was adopted.

The following officers were then elected :

President ..... Percy B. Gregson.
First Vice-Pres. ..... C. W. Peterson.
Second Vice-Pres ..... G. Wolley-Dod.

Directors, Entomology, F. H. Wolley-Dod, Calgary, and Rev. J. Hinchcliffe, Red Deer; Botany, Mr. Nivens, Prince Albert, and Mr. Hutchinson, Regina ; Ornithology, Dr. Henry George, Innisfail, and F. Dipple, Calgary, and T. N. Willing, Regina, Secretary-Treasurer.

It was decided that the report of the president of the late North West Entomological Society should be included in the first annual report of the Territorial Natural History Society, and also inasmuch as the excellent work done by the Entomological Society led to the formation of the Natural History Society, that the liabilities of the former be assumed by the latter.

It was resolved that three official Museums should be established, one at Blackfalds for the district north of Calgary, with Mr. Percy B. Gregson as Curator ; one at the Territorial capital (Regina), with Mr. T. N. Willing as Curator ; and the third at Calgary, with Principal J. B. Boyce as Curator.

A resolution was adopted unanimously urging the Territorial government to provide at the earliest possible moment the necessary accommodation for a public natural history museum, such as is maintained in all the provinces.

After a vote of thanks to the Chairman, a motion to adjourn was adopted. It was decided to hold the next annual meeting at Calgary, during the Convention week of the Agricultural Societies in May.

WILLIAM E. SAUNDERS.

In this issue of our Report, we have pleasure in presenting to our readers a portrait of the Secretary of the Entomological Society of Ontario for the last fifteen years, Mr. Wm. E. Saunders, who is well known as a prominent member of the fraternity of Canadian Naturalists. Mr. Saunders's home is in London, where he was born and where most of his life has been spent. His father, Dr. Wm. Saunders, Director of the Experimental Farms of the Dominion, has always been devoted to the study of the natural sciences, and hence the son's attention was in early years directed to similar pursuits, interest in them being maintained by the making of collections in the different departments. Geology, Botany, Entomology and Orinthology all in turn provided object lessons for study, training the mind to habits of close observation, and filling the leisure of later years with delightful employment.

After a few years of miscellaneous collecting, Mr. Saunders turned his attention more exclusively to Orinthology, and as soon as the use of a gun was permitted, he commenced a scientifically arranged collection of our native birds, showing male and female in summer and winter plumage, with any variations from the type, also the nest and eggs of each species. Year by year the collection is added to, until now it numbers over one thousand specimens. Mr. Saunders's birds are his intimate friends, and whether in his own house or on the public platform, his "Bird Talks," illustrated with specimens, show to his audience that he speaks of what he has learned by personal experience in the fields and woods. His enthusiasm for this study is such that he counts it no hardship to walk miles into the country in time to hear some favorite songster greet the dawn. He has also been known to spend a night in the woods in the depths of winter, just to see what he missed by spending his nights in bed!

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About two years ago, Mr. Saunders accompanied his father on an official visit to Sable Island, a place he had long wished to go to in order to see the only known breeding place of the "Ipswich" sparrow. The impressions of this trip were given to the public in an article in one of our local papers, which has since been adapted for some of our scientific magazines. Mr. Saunders was able also to enrich his collection by several specimens of the rare sparrow, as well as some other beautiful birds, which have their habitat on that interesting island.

Although Mr. Saunders is kept fully employed in looking after his business interests, he finds a change of work sufficient to afford him the rest he needs, hence he has employed his leisure time in many pursuits, and while Ornithology may be called his principal "hobby," he has gone rather extensively into gardening and horticulture generally; extensively, considering the size of his lot on Central Ave., but the amount of fruit and flowers there produced is a surprise and a pleasure to all his summer visitors. His well known love for these pursuits, and his knowledge of horticulture generally has occasioned his recent election to the chairmanship of the committee who have in charge the care of the street trees in London.

Mr. Saunders received his education principally in London, though two or three years were spent in boy's colleges elsewhere. As it was considered best for him to enter the drug business so long conducted by his father, he was sent for two years to the Philadelphia College of Pharmacy, where he graduated with the highest honours. Soon after his return to London, he was taken into partnership with his father, but on the latter being appointed Director of the Experimental Farms of the Dominion, Mr. Saunders retired from the retail business, and entered the wholesale exclusively.

On the establishment of the Western University he was appointed to the chair of Chemistry, which he held until the claims of his own business forced him to relinquish the position.

EDMUND BAYNES REED.

The older members of the Entomological Society of Ontario will, no doubt, welcome with much pleasure the portrait of Mr. Edmund Baynes Reed, which is prefixed to this volume. He was one of the small band who originated the Society on the 16th of April, 1863, and is one of the few survivors who may expect to commemorate its fortieth anniversary a few months hence.

Mr. Reed came to Canada from England when a young man and took up his abode in London, where he for some time practised his profession as a lawyer. Later on he became Secretary-Treasurer of the Synod of the Diocese of Huron and continued to occupy this position till he left London for British Columbia in 1890. He was always devoted to Natural History and especially to the collection and study of insects. His leisure time was largely given up to these pursuits and to the work of the Entomological Society, in which he took the warmest interest. He and Dr. Saunders were instrumental in forming the London Branch of the Society and keeping up the enthusiasm of its members. When the head-quarters of the Society were removed to London and there was in consequence no further need of a Branch, Mr. Reed took an active part in everything that was done and gave most material help in the formation and increase of the library and collections. He was Secretary-Treasurer of the Society in 1871-2-3 and from 1880 to 1886; Vice-President in 1874, 1877 and from 1887 to 1889; member of the Council from 1874 to 1876 and in 1878 and '79; and during many of these years Librarian and Curator in addition. The following extract from the report of the Council for the year ending August 31st, 1890, bears testimony to his usefulness and services:

"In consequence of the removal of Mr. E. Baynes Reed from London to British Columbia, to take charge of the Dominion Meteorological Station at Victoria, it will be necessary to make

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some new arrangements for the care of the library and collections, and the performance of the official work of the Society. . . . . The Council desire to place on record their feelings of deep regret at the removal of Mr. Reed from this Province and the loss which the Society thereby sustains. Mr. Reed is one of the original members of the Society and for more than a quarter of a century has been one of the most active and zealous of its officials, filling at different times the positions of Vice-President, Secretary-Treasurer, Librarian, Curator and Auditor. To him it is especially due that the library has grown to its present dimensions and value, and that so much progress has been made by the Society in many directions. The Council beg to thank Mr. Reed for his services in the past and wish him all possible success and prosperity in his new and important sphere of labour."

Mr. Reed was a constant contributor to the pages of the *Canadian Entomologist* from the very first volume, in which appeared five articles from his pen. His papers, largely collecting notes, records of rare captures, etc., were always interesting and valuable; he also furnished descriptive articles on larvæ, an accentuated list of Canadian Lepidoptera, a report to the Department of Agriculture (jointly with Dr. Saunders) on the Colorado Potato-beetle which had then invaded Western Ontario from the neighbouring State of Michigan, and popular papers on common insects.

In the preparation of the early annual reports of the Society he took a large share and contributed elaborate and valuable papers, as follows: Insects affecting the plum, Report I. (1870), pages 53-63, and Report II. (1871) pp. 22-26; Insects injurious to the potato, *ibid*, pp. 65-81; Insects attacking the cucumber, melon, pumpkin and squash, *ibid*, pp. 89-92; Insects affecting maple-trees, Report III. (1872) pp. 35-43; Insects affecting the peach, *ibid*, pp. 44-47; Insects affecting the potato, *ibid*, 48-50; Some common insects which affect the horse, ox and sheep, Report IV. (1873) pp. 34-41; Entomological contributions, Report V. (1874), pp. 11-16; Sphingidæ—Hawk-moths, Report XII. (1881), pp. 48-70; Diptera—Two-winged flies, Report XIII. (1882), pp. 45-53; and short articles in several issues. From the above list it will be seen that Mr. Reed gave much attention to economic Entomology and did some very excellent work in that department. It was quite fitting, therefore, that he should have been one of the company who, in August 1889, formed the Association of Economic Entomologists and signed its original Constitution.

Another valuable and important work that Mr. Reed performed for the Society was the compilation of a General Index to the first thirteen Annual Reports, 1870-1882, which proved of the greatest use for many years to the members of the Society and others who had occasion to refer to these publications.

For some time before he left London, Mr. Reed took a great interest in Meteorological Observations and in connections with the Observatory at Toronto established a local station and installed the necessary instruments. His anemometer and vanes were placed on the top of the Cathedral tower and connected by wires with his residence on the corner of Park and Queen's Avenues. The work that he thus performed was so accurate and satisfactory that he was selected to take charge of the Pacific Coast Division of the Dominion Meteorological Service, and since 1890 he has continued to fill the office of Superintendent of the Observatory at Victoria, B.C. Though his time is fully taken up with his official duties, he continues to be interested in Entomology and is a member of the British Columbia Natural History Society. His many friends will, no doubt, heartily join with us in the wish that he may enjoy the blessings of health and well-being for many a year to come and retain the vigour and vivacity which have always been his characteristics. C. J. S. B.

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ANNUAL REPORT

OF THE

BEE-KEEPERS' ASSOCIATION

OF THE

PROVINCE OF ONTARIO

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

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RECEIPTS.		EXPENDITURES.	
Cash on hand from previous year.....	$100 36	Grants to societies and fairs.	$225 00
Members' fees.....	132 00	Officers' salaries	75 00
Legislative grant..	500 00	Expenses of convention.....	10 00
Fees from affiliated societies	45 00	Directors' fees and expenses..... ..	203 80
Use of stenographer's report	12 00	Postage and stationery.....	25 58
		Printing and advertising...	66 25
		Periodicals for members	85 80
		Cost of reporting.....	50 00
		Expenses of executive and revising committee	28 50
		Auditors.....	4 00
		Balance on hand.....	15 43
	$789 36		$789 36

Examined and found correct, December 17th, 1902.
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ONTARIO BEE-KEEPERS' ASSOCIATION.

ANNUAL MEETING.

The Ontario Bee-keepers' Association held its twenty-third annual meeting in the Court House in the town of Barrie, on December 16th, 17th, and 18th, 1902.

The Secretary read the minutes of the 22nd Annual Meeting, held at Woodstock, which, on motion, were confirmed and signed by the President.

PRESIDENT'S ADDRESS.

By J. D. Evans, Islington.

I am glad to greet you again to renew our friendship and exchange our experience. While the past year was not a record breaker in the yield of honey, still the yield was fair and the quality and the price good.

One of the lessons that we have learned is that there is never a good crop in all parts of Ontario in any one year, and any apiarist who has a large crop of honey should make enquiries as to the honey yield in the whole Province, before jumping to the conclusion that it is abundant and going to be cheap. The importance of correct information on this point, and the influence of the Association in keeping up fair prices, was well illustrated in the disaster that befell the attempt of certain commission men in Toronto to break the honey market last fall, and in this connection I wish to say that the thanks of the Association is due to Mr. Byer, of Markham, for his prompt and energetic action in the case.

I am much disappointed in the slow increase in our membership. Early in the year the Executive prepared a circular, showing the usefulness of the Association to bee-keepers, and had it mailed at considerable expense to about seven thousand bee-keepers in Ontario. I regret to say that the increase in membership did not justify the expense. It seems amazing to me that any bee-keeper should be so blind to his own interest as to stand aloof from so useful a society.

I was surprised at receiving only six applications for the services of the Inspector of Apiaries during the year, and wrote Mr. McEvoy asking him to let me know what applications he had received and what apiaries he had visited. The inspector refused to give me this information, and quoted some old resolution passed in the time of the late Mr. Pringle, forbidding him to give any information of this kind except to the Minister of Agriculture.

If any such resolution is on the books of the Association it is of no force whatever, as, by the Statutes of Ontario, the inspector has no authority to visit any apiary unless where sent by the President of the Society. See section 3 chap. 283, R.S.O. 1897.

Section 6 of the same Act, provides a fine of not less than $20, or more than $50, or imprisonment for one or two months, for any owner who conceals the fact that foul brood exists among his bees.

Section 10 of the same Act reads: Every bee-keeper or other person who is aware of the existence of foul brood, either in his own apiary or elsewhere, shall immediately notify the President of the Ontario Bee-keepers' Association, of the existence of such disease, and in default of so doing shall, on summary conviction before a Justice of the Peace, be liable to a fine of $5 and costs.

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Section 12 of said Act orders the Association to report to the Minister of Agriculture each year, the number of colonies destroyed and the locality where found, so that the secrecy sought to be observed is contrary to the law and absurd.

I think the Association should seek for the authority to appoint a Sub-Inspector in each of its districts, and thus save unnecessary travelling expenses, and that in future our Presidents should strictly enforce the law that no Inspector or Sub-Inspector inspect any apiary unless directed by the President for the time being. It would be well to have a by-law passed defining the duties of the Inspectors, and also to have the Act for the Suppression of Foul Brood among bees printed in the minutes of this Session.

I greatly regret that, through some misunderstanding, Prof. Harrison, of Guelph, was not in a position to carry out his experiments in curing foul brood with formalin. He wrote the Secretary early this season asking for samples of foul and black broods, and asked that Mr. Gemmell supply them. Unfortunately, through the delay in the correspondence, and the fact that the Sub-Inspector was busy, samples were not sent until it was too late, and we will have no report from the Professor. I hope he will be supplied with all necessary materials for his experiments next season, for they are of the utmost importance.

I hope we may have a pleasant and profitable meeting.

Considerable discussion arose over the clause in the President's address relating to the Inspector of Apiaries, and it was thought by the members present that the Foul Brood Act should be carefully examined, to see whether any change was desirable in the wording of the Act. Following this suggestion, Mr. Holterman moved, seconded by Mr. Sparling, that a committee be appointed by the President for this purpose, which, on a vote having been taken, was carried.

QUESTION DRAWER.

Q. Can slightly fermented honey be safely used for spring feeding?

Mr. CHRYSLER: I would say yes, but I would prefer to heat it and evaporate it to the consistency of ripe honey. I believe I would add water to it to make it thin enough for the bees to take it more quickly, because if it is too thick they will gorge themselves.

Mr. DARLING: Have you ever fed any fermented honey?

Mr. CHRYSLER: Not very much; I have fed a little.

Mr. DARLING: I did once or twice, but I never had the bees boom as hard as they did on slightly fermented honey, and I did not heat it at all.

Mr. CHRYSLER: When I spoke of heating it to evaporate it I did not know to the extent to which it might be fermented. There is a great deal of difference in fermented honey. If it was left long enough it might almost have gone to vinegar, As I look at the question again I see it says "slightly fermented."

Mr. DARLING: Mine was not fermented very much; I would not like to feed it after it gets to the alcoholic or vinegar stage; it was only so that you could notice a sour smell to the honey.

Mr. MCEVOY: When did you feed it?

Mr. DARLING: In the spring. I fed it inside of the hive but outdoors, and I never had them build up as fast.

Q. How do you know foul brood and what would cure it?

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Mr. CHRYSLER: I am unable to answer that. I have never had any foul brood; the only time I ever saw it was about six months after the bees had all been killed by it. As to the curing of it, Mr. McEvoy or some other person, who has had more experience than I, should speak.

MR. MCEVOY: There are a great many kinds of dead brood; there are two or three stages in which the resemblance is very strong, and if you make a mistake make it on the safe side. Do not take chances, because I have often heard people say, "If I had only known what it was at first." But they distributed combs for the bees to clean up, and they got their yards cleaned up instead. When the decayed brood assumes that ropy, sticky consistency, this that they call black brood has the closest resemblance to it. They both require the same treatment, but with the foul brood it has a fine stretch, like India rubber; in its final stage it is of a dark coffee color. That is the only way that a stranger or inexperienced person may be guided in knowing it. Seeing dead matter in the comb is not always a guide. It may be dark, it may be poisoned, or black or foul brood. Now, as to treatment: The bees must first be thoroughly cleansed of the old honey that they took from the old hive. There are times when you could shake them on to full sheets of foundation and make a cure, but it is too risky. For while you may cure nine-tenths of the bee yard, if it failed in the other one-tenth, it would only go and destroy all you had done.

If it is in the honey season shake the bees down on little starters, taking all the comb out. Shake them into the empty hive, and give them half an inch of comb foundation starters and do the work in the evening. If the flow should stop or slacken through rains or unsuitable weather, apply the feeders at once, and start a flow in that way, and they will draw out these little pieces of foundation. If you allow the little they brought from the old comb to be stored in the new that will cause trouble. Take away, therefore, the built-out starters, and give them sheets of foundation, and when this foundation is worked out it is forever gone in every case. This will cure every hive it is found in.

It is one thing to cure the bees, but you may cure with a great loss. That is, you may destroy all the healthy brood also. Leave about the quarter of the bees, after you shake them down, on one set of combs. Take the combs from this, that, and the other, enough to make two stories, and leave it about ten or twelve days, and most of the brood will hatch out. After about ten days in the honey season shake them down, and put them through this treatment again and give them a queen or queen cell. In going through the bee yard put a cross upon those hives; if one is very bad put three crosses, if middling, two, and so on.

Do not do this work in the morning or the middle of the day, because if you shake the bees out and do it in the middle of the day they will become restless, and some will swarm out and mix in with what you have already treated.

After the honey season is passed, and you find a few diseased, even if it is only a few cells, don't think that it will ever cure itself, because as long as a comb lasts it will remain. Those few that are there let alone, but take the others that are sound and feed them sugar syrup until you get a lot of nice sealed combs. Feed them until the combs are sealed solid. In an evening in October go to the diseased colonies, lift the combs out, shake the bees back and give them five or six combs of these sealed stores. The honey they took out of the infected combs they have got to keep, as they have no place to put it; the queen has stopped laying, the cold weather is coming on, and it will be digested and taken out of the way. Just as good a cure as in June or July.

Never attempt to cure in fruit bloom. It is too risky, because the weather might change suddenly, and the flow stop, and you would meet with quite a lot of starving larvae, which will consume the unsealed stores, and they will not

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uncap the stores they have quick enough to feed the amount of brood. It is not proper to do it then; wait until June.

In these weak colonies you have two or three stories on, take two or three or whatever it may require to make a good swarm; cleanse that and cure it. With these others that have plenty of fine brood, tier the brood up, and you will make up what you lost; you will gain it in the new.

This shook swarm business I have noticed in all the journals, and to give the editors their due they have got out a lot of fine articles. Some have gone so far as to say they are going to cure a foul brood with it. Not always; they may in some cases and under some circumstances where there is not too much, but they will never cure a badly diseased yard; it is impossible. The main thing is to cleanse the honey taken from the old comb. What do you say, Mr. Post?

Mr. POST: I think your system is all right; it worked all right in my neighborhood.

Q. What has been your experience with foundation known as the Weed Process?

Mr. CHRYSLER: I have not used it; I cannot say.

Mr. BROWN: I have used what was said to be manufactured by the Weed process, and I could not see any more advantage in it than what has been made by the ordinary process.

Mr. ARMSTRONG: I have used both kinds. I have used quite a quantity for the brood chamber; I don't want to use anything else. I make foundation myself, and with the Weed process you can use a much lighter grade; I am satisfied you can get more sheets for the same amount of wax, and it is a great deal stronger than the kind I make by hand; it is nearly all machine made.

Mr. BROWN: What is the trouble with it in the sections?

Mr. ARMSTRONG: I will not say anything about that just at present.

Mr. HOLTERMANN: What Mr. Armstrong says is perfectly correct. For brood foundation you can use a lighter grade, and it does not sag. There has been objection found to the section foundation; some claim that the bees do not work on it as readily. As far as I know I have not found anything in that. But the claim is that the pressure in milling makes it harder.

Mr. POST: I think the sheet is correct, but they draw it in milling it.

Mr. HOLTERMANN: The difficulty I mention was to overcome that. The tendency was to stretch the cell a little, when the man does not watch the temperature in milling, and to remedy that they are thinning down the sheet so that as they thin, what is left in the sheet will just make the cell wall.

Mr. CRAIG: We are now preparing a machine, or rollers, that will reduce the thickness of the sheet before it is put through the mill, and I believe will altogether prevent the stretching of the cell that has been mentioned by Mr. Post. So far as section foundation is concerned, we have had reports from some who say that the bees will work on the Weed process foundation sooner than they will on the other, but of course there are so many reports it is hard to decide. In an experiment we had of this sort, I believe that in the case where the foundation was made by hand the wax that was used was from the cappings, and this being so much harder the bees did not seem to draw it out so soon or so quickly as they would the ordinary grade, so that I did not think the experiment amounted to anything.

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Mr. ARMSTRONG: A great many of the members will remember the time Mr. Shaver had the samples of different foundations on exhibition at Toronto, and I happened to know something about the hand-made foundation that he had, and it is just as Mr. Craig said. It depends altogether on the wax you are using for the foundation. You can take cappings and make foundations out of them that is much harder than that which is made out of the yellow wax or out of the old combs. Another thing, if one lot of foundation has been made last year, and the other now, the bees will take the quickest to the fresh made unless you put it in warm water and bring the water to a certain temperature as quickly as possible, for that will help it. If you want to make a thorough test, you should take one grade of wax, make it at one time, and give it to the bees at one time.

Mr. DARLING: I have had no experience in using this. I got a letter from a gentleman in Pembroke who had used it, and who wanted to know if I had had any experience. He said he fancied, in his experience, that the bees did not take as kindly and as quickly to the patent process foundation as they did to the old fashioned foundation.

Mr. NEWTON: I mind well meeting Mr. Armstrong and Mr. Shaver at the Toronto meeting. There was a question in the question box similar to this, and they wanted to know why I didn't say anything on the subject, and I told them I did not wish to, because it was not a fair experiment. It has been explained this afternoon, just as I told Mr. Armstrong and Mr. Shaver, that the samples of wax were not to be compared together; that one, the old process, was made chiefly of cappings, while the other was made of that yellow wax, and in that way they should not be compared at all, because one is much softer than the other. Any one who makes or uses foundation knows that. I have been making the old process. Mr. Holtermann thought the new process could be made stronger. Well, it is tougher, I will admit that; yet for the last two years where we have been milling in eight sheets to the pound I have found the customers like that just as well as the Weed, and they find just as much satisfaction with the eight sheets to the pound as they did with the Weed. I have tried the two in the section, and I always found the bees took to the old process in the section ahead of the Weed; but I cannot say as to the brood, because I have never tried it. I think the Weed is tougher, and I think that is one reason why they take to the old process.

Mr. HOLTERMANN: I think when we go over the experiments which have been carried on with the different foundations in the United States that the evidence is just the other way—that what the bees have preferred is the Weed process. But I admit that it is right they should all be made out of the same kind of wax, and used at the same time; and when we are experimenting with living things the more we understand and know about these things the slower we will be in coming to conclusions. Now as to the grade of wax; I cannot see at all that one who is manufacturing largely cannot return as good a sample. Most of you know that I was with a certain supply company for many years, but to-day I have no interest whatever in comb foundation at all. In refining wax, when you can collect your wax and take the various grades, and have got wax enough coming in, you can separate these kinds and put them into a tank, and get a better and more refined wax than handling it in small quantities; you require to use judgment.

Mr. B. O. LOTT: Is there any difference in the least in the cells under the Weed process for the brood chamber? Do they come nearer to drone cells than those which are manufactured under the old process? I claim they do, and my experience, I think, will be borne out by Mr. Post, who is right near me. This summer I noticed, in going through the brood chambers and taking out from

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three to five combs and using them in the top stories, that they admitted that the queens would not accept of them. They certainly are larger cells; they run from three to three and a half and four cells to the foot more than they do under the old process. I find in my apiary that the queens will not accept them the same as they will the old foundation. That has been my experience.

Mr. HOLTERMANN: It is made on the same mill only they have been negligent, in allowing it to stretch.

Mr. McEVOY: With reference to what Mr. Lott has spoken about, five is the average number to the inch, and anything less than that the queen would reject. Mr. Craig says his company are going to make that right; if so, everything will be all right.

Mr. CRAIG: Our friend will understand that the mills are exactly the same; it is a Root mill. The mill our company uses, is exactly the same as that used for the old process. The base of the cell is just the same.

Mr. ARMSTRONG: I think where the difficulty comes is between the mill and the rollers that carry the foundation out.

Mr. CRAIG: That is it exactly.

Mr. ARMSTRONG: When it goes through the rollers the temperature is too high, and the sheets too soft and the rollers that carry the foundation away from the mill draw it out faster and stretch it, and the stretching is done between the mill and the roller, as I understand it. When it leaves the mill there is no difference.

Mr. CHRYSLER: Some one said that the foundation that was old was not as good as that freshly made; that is all a mistake. If the foundation is put away and boxed you can keep it for years, and I will guarantee it will be as good as that freshly made. You must keep it from the air and light.

Mr. DARLING: There were, I do not know how many, samples of foundation at Ottawa last year, and it fell to my lot to see those; but, as far as workmanship, quality of wax and such things as that are concerned, I do not think it would matter much which a man took, but there must have been four different sizes of cells, and they varied as much as a seventh. I do not know that they varied as much as a sixth.

Q. If you wish to change your extracting combs from a small to a larger size how would you do it?

Mr. CHRYSLER: If I wished to change them to a deeper instead of a longer comb, if it was desired not more than one or two inches deeper, I would mix in frames with starters of the length I desired to use for the next season. You might get little additions to the first frame, but it will not amount to anything, and you can then, after you get a stock of deeper frames, dispense with them and melt them up again. If the length is different, and will not fit into the hives, you cannot re-manufacture the frame over to advantage. I would melt the combs up.

Q. Is it desirable to put full sheets of foundation when making forced swarms?

Mr. CHRYSLER: No. I think it is a detriment to success. If you use full sheets in hiving them that way you will make a better success by putting an empty body under it from two to three days and then taking it away.

Mr. POST: What is a forced swarm?

Mr. CHRYSLER: It is supposed to be a shook swarm.

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Mr. POST: I think it might be answered more intelligently if we knew whether they wanted to produce extracted or comb honey. I think for extracted honey, foundation by all means; I think starters would be better for comb honey.

Mr. DARLING: Why treat them differently from a natural swarm?

Mr. POST: If you put about five or six in a forced swarm or a natural swarm they are very apt to build all worker comb; add say eight or nine frames and they are more apt to build drone combs.

Mr. NEWTON: Running for comb honey if you will put your hive full of starters you are very apt to get a good bit of drone comb; if you use four or five starters, and fill up with dummies, you get pretty near all worker combs. As far as shaking is concerned, this is the first year I have tried any shaken swarms, and all that I have tried I have hived on starters, and I have found it very successful. In looking through I found there was very little drone comb.

Mr. DARLING: My question was why treat them differently from a natural swarm?

Mr. POST: I do not think they should be.

Mr. GEMMELL: It would depend a great deal on the season.

Q. Is the shook swarm system a success?

Mr. NEWTON: The shook system can be made a success, but it wants to be done in time. It should be done when there is no honey coming in.

Mr. CHRYSLER: As far as I have practiced it—it has been somewhat limited—I find if queen cells are started that it is a success. As to shaking prematurely I could not verify that, whether it would be a success or not in every respect.

The PRESIDENT: Would you advise to wait till queen cells are started.

Mr. CHRYSLER: Some sign of swarming, and then you are all right.

Mr. HOLTERMANN: This question of forced swarms is one we have had in the bee journals almost all summer and it seems to me this association should be able to say something about it.

Mr. GEMMELL: I think a good plan is to read some of the bee journals; we have had some good points as to how and when to make those swarms and make a success of it. You must not make those forced swarms when there is no honey coming in. There must be some honey coming in, and you must see that the bees are well filled with honey before you shake them so they go prepared to secrete wax. You must take the forced swarm as much like a natural swarm as possible, and then the chances of success are a great deal better.

Mr. HOLTERMANN: I would go so far; when I went through a yard I would not treat a swarm, unless for some peculiar reason, until they had the swarming impulse, and had cells started. Then smoke the bees, and as you go through the yard go from one to another; go back occasionally and smoke it so that the bees will fill themselves thoroughly with honey, and then shake them off. Unless you give the brood to weaker colonies do not remove all the bees, but partially shake so that some bees will remain and you will leave something to take care of the brood.

Mr. MCEVOY: What is the object in view of the shook system? Is it an increase in the bees or honey, or both?

Mr. PETTIT: To control swarming.

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Mr. GEMMELL: The idea is to try to get away with a lot of extra work when you are not prepared to look after it. You virtually take the swarming to a certain extent in your own hands.

Mr. DICKENSON: And prevent increase. It would not apply to gentlemen who want to go on and increase their colonies.

The PRESIDENT: Most of you in reading articles on this question have seen you are warned not to leave the brood in the hive. We have always been taught by leaving brood in the hive it would keep the swarm there. What is the experience on that head?

Mr. GEMMELL: I never gave a card of brood to a swarm of bees in my life to keep them there.

The PRESIDENT: Would it have the effect of driving them out?

Mr. HOLMES: I might say that I have on a number of occasions noticed swarms of bees that had just lately been put in the hive that were uneasy, and was warned of the fact that they were going to leave the hive; but by placing a card of brood in the hive they quieted down and stayed.

Mr. EMIGH: So much depends on circumstances, and a good deal on what you want, that it is hard to make any rule that will suit everybody I have done some of this forced swarming this year but did it differently. I did it to get the most bees together in one place if I could, and to save increase as much as I could, and in order to get as much comb honey as I possibly could. The way I did it is this: When we had a swarm—I did not have the queens clipped—I took another hive that was as strong as I could get, and I shook every one of the bees from that into an empty hive with starters. I then took this swarm, after they had lit, and put them in with the swarm I had shook. Then I had two good choice swarms on starters, and I took away this brood that I shook the bees off, and put it on top of the one that had swarmed out, so that I had no increase, had the working bees all together, and had them on starters. Then if I had metal boards enough to put on I put them on, and put the sections right on, otherwise I let them be three or four days before I put any sections on, and we got a very fine lot of sections and very little increase, and I think that is a splendid thing for comb honey.

Mr. MCEVOY: Allow me to endorse what Mr. Emigh says; I don't think you will ever get anything better.

Q. How can you get rid of robber bees following you around the yard when working with them?

Mr. CHRYSLER: I have been bothered this last season a great deal that way I knew the colonies that were producing those cross bees, and I shook them on to starters: I smoked them thoroughly and got them thoroughly roused up. In fact I was working with them before I started to do this, and it was almost impossible to work with them; I got them thoroughly filled with honey and shook them on to the starters, and put on sections, and I found that colony of bees was very quiet the rest of the season.

Mr. HOLTERMANN: I do not see how robber bees could be got rid of in the way that is mentioned.

Mr. ARMSTRONG: I put the question in. If we can get rid of those it will be a great help.

Mr. NEWTON: I would say use a bee tent.

Mr. HOLTERMANN: I have a system of working which, in my estimation, is the best I have ever tried. On every hive I have a large portico at the front

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and I have a groove at the front, and into that I can slip a screen, and I can work undisturbed. I will give you an instance: In the fall of the year those of us who produce buckwheat honey know how strong that smells, and when you have to extract that during the time when they rob, if ever you have a lively time that is the time. I have to extract this honey and do it alone, and the principle I work on is this. At night, or early in the morning, I go around, say, the whole one hundred colonies, and I slip in my screens, and the bees are shut in there, and I can go to work and extract, and I can do it alone and work all day providing bees do not come from a distance. The bees are there perfectly quiet, and they do not wear themselves to death, because they can get out into these porticos and are comparatively at liberty.

Mr. McEvoy: By that time I think I would put bee escapes under each one, and run them down and wheel them away.

Mr. Post: At the close of the extracting season, usually in the buckwheat time, is when they follow you around the worst, and my plan is to go to the yard in the morning and set out about twenty-five or thirty top stories that I have extracted the day before and let the bees clean them out, and you can go on with your work and they will not trouble you a particle.

Mr. Newton: I cannot see through Mr. Holtermann's plan, because he cannot shut those in while he opens the top of his hive; there are some that will come out in the air, and what will become of those?

Mr. Holtermann: There is no trouble whatever in quieting those bees down, because those that have escaped will cluster on the screen; they are not going around robbing other hives.

Mr. Pettit: I have tried this plan, but I think not so thoroughly as Mr. Holtermann. I tried it specially at an out-yard. I didn't get there early enough in the morning to shut them all in, and the consequence was there was perhaps part of the swarm on the outside of each portico, and these gave me considerable trouble; but I have tried Mr. Post's plan, and I find it very successful. I think perhaps one is as good as the other. I might say these porticos are very useful for a great many things, especially for moving bees.

Mr. Holtermann: I always have objected for many years, and will object to anything which means scattering the honey of combs among all the bees in the yard. I do not know of a cell of foul brood in our yard, but there are a great many other people who have not known it either, and they have had it, and anything which tends to bring about a scattering of the honey from a hive amongst all the rest I for my part will never practice.

Mr. Gemmell: How do you clean out your combs? Put them back in the same hive?

Mr. Holtermann: It is very easily done that way.

Mr. Lott: For instance with buckwheat honey?

Mr. Holtermann: Just put them back upon the same hive and they will do it very easily.

Mr. Dickenson: I would go out of business if I had to resort to that plan, and I will take my chances on foul brood.

Mr. Post: So will I.

Q. Would you expect bees to winter in a dry cellar where the temperature stands constantly at 41 degrees Fahrenheit?

Mr. Chrysler: I would say yes, if fresh air could be maintained constantly.

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Mr. PETTIT: I would say that that was a perfect cellar.

Mr. BYER: This winter for the first time I am wintering some in the cellar; I have made no special preparation. I put fifty colonies in, and the thermometer had never varied since they were put in from 41 degrees, and it is a little low. As I understand it the perfect winter cellaring should be 44 degrees.

Mr. DICKENSON: Do the bees hum ?

Mr. BYER: They are fairly quiet.

Mr. HOLMES—I have wintered bees with great satisfaction to myself for a number of years in a cellar where the mercury stood at from 40 to 42 degrees.

MARKET REPORTS.

BY J. L. BYER, MARKHAM.

For different reasons, it was with much reluctance that I consented to write up a short paper on this phase of our business, my chief objections being my lack of experience as compared with a number of my hearers of to-day, coupled with the fact of certain peculiar and somewhat unpleasant conditions existing this past season—the same, no doubt, which prompted our Executive Committee to bring this subject before you at this our annual meeting.

From the first it has seemed to me that the term "Market Reports," was hardly comprehensive enough, "Crop Reports," to my mind, being a little more expressive. With this thought in view, I have taken the liberty to use the two phrases; not exactly as synonymous terms, yet in conjunction the one with the other. For the sake of convenience, I have divided the subject matter under two headings, "Market or crop reports, as published in the regular market columns of our bee journals and other papers," and "Market or crop reports appearing from time to time in the news columns of our dailies and other periodicals." With the first named part of the subject, I believe there are few of our bee-keepers who have much to complain of, as far as I have been able to ascertain The bee journals giving us reports of crops and prices of honey, are reasonably correct, and are endeavoring to the best of their ability to give the bee-keepers all the information they are able to, under existing conditions as they are to-day. As to our daily and weekly papers, I have never noticed that the general public, or merchants either, for that matter, take much stock of honey quotations, in the regular market columns, sometimes having received more for my honey than what the market quoted, and at other times less. From the "Honey Column," in *Gleanings*, September 15th issue, I copy the following extract of report, forwarded to said paper, under date of September, 1902, by a Toronto firm which handles considerable honey each year: "Extracted honey, white clover, good body, 8 cents per lb. Some was bought at 9, even at 10, but the crop turned out better than was expected and bee-keepers are willing to take less. It seems a mistake that bee-keepers are all crowding their produce on the market at the same time, and what they cannot sell, they consign to commission houses who always break the price." The facts as outlined in this report are so simple as to need no comments from me. While not aware that any considerable quantity of honey was placed in the hands of commission men so early as Sept. 10th, I am, however, quite alive to the fact, that it is quite natural for the bee-keepers (especially we of slim pocket-books) to exchange their honey for money, just so soon as they can get what they consider a fair remuneration for their product. Let me add, that as long as the marketing of the honey crop is conducted in the haphazard manner of to-day, any amount of preaching to the

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contrary, will not prevent the bee-keeper of limited circumstances from converting his honey into hard cash at his earliest oportunity. These remarks might perhaps be applied to the small producers as well: a class, by the way, who have been censured so much in the past that we can well afford to leave them alone in the discussion to-day. The second division of our subject is, no doubt, by far the most important one for us take into consideration; perhaps the only part of the question that we are much interested in. For some inexplicable reason, anything appearing in the news columns of our papers is at once swallowed as gospel truth, by the majority of readers. This fact has often been the means of prompting people to circulate false items and reports for the sake of "the sensational," for notoriety, individual gain and other selfish reasons. It may be that some who took the bait held out in our papers this past season, and who are yet smarting from the effects of the barb, will be hoping that a tirade of abuse will be showered on the heads of those "awful fellows" the wholesale men. While yet in sympathy with methods of business as practiced by certain firms, yet I realize, as every fair-minded man must, that this question, like all others, has two sides to it. So, instead of denouncing the "other fellow," my purpose to-day will be rather more to see if we as bee-keepers, are not sometimes, to a certain extent indirectly responsible for the reports being circulated adverse to our interests. "Charity begins at home;" likewise some other virtues, so I will give an instance in any own experience this past season, which taught me a little lesson. During the busiest part of the season, the editor of one of our local papers paid us a visit in the apiary one afternoon. Being very busy, I forgot to "put a flea in his ear" before he left us, as to any report of his visit he might write up in his paper. The following week I was surprised to find in a quite racy account of his visit with us, the statement that we would have so many "tons" of honey this year. While the statement was not so much of an exaggeration, yet I felt sure that it would have a bad effect; as to the average reader a ton of honey seems like something prodigious. Although I at once interviewed the editor of our other local paper, and asked him not to copy the item in question, this did not prevent local papers in adjoining towns from copying the same. Now as to results: In a short time letters came to me asking for quotations on honey, coupled with statements like these: "Honey must be a great crop this year," "As you have so much it ought to be very cheap," etc. A much more forcible illustration in this line, was the notorious statement published in one of our Toronto dailies, purporting in effect, that honey was a great crop in all sections of Ontario, consequently would be cheaper than for some years; also stating that a certain wholesale firm had had the refusal of a large quantity of extracted honey. To make matters worse the Associated Press copied the article, which was scattered broadcast over the land, and somehow the authority of the Department of Agriculture became attached to the same. It is only fair to say, that the firm in question, after some time repudiated the statements credited to them. However, that did not prevent a number of bee keepers from stampeding in the meantime, and selling their honey at a very low figure. Now as to the bee-keepers' part in causing reports like to be sent out. While, as before intimated, I do not endorse the methods employed by certain firms to find out what the crop of honey is, yet the fact remains, that if they are going to do business in a business manner, they must in some way, at least have an idea as to the amount of honey in sight. As long as we as beekeepers do not provide them with better plans for gaining information of the honey crop, we should not be too emphatic in saying just what, or just what not, they shall do. I venture to say that if we could have the privilege of perusing some of the letters sent to the wholesale firms by beekeepers, in answer to query as to their crop of honey, that we would be greatly surprised at the glowing accounts of big yields, etc. We would not

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wonder that wholesalers sometimes jump at conclusions. Some time in September of this year, speaking with different wholesale men in Toronto, I was surprised to hear them speak of beekeepers coming to them and telling of their big crops of honey. One man in particular, who had a fair crop of honey this year, seemed to have visited neary every firm for the purpose of expanding himself. I did not wonder, that when I tried to assure them that there was not a large crop of honey in Ontario this year, that they shook their heads in a knowing way, intimating that I "had an axe to grind," or I would not talk like that. In conclusion, while having only treated this subject in a superficial way, yet I frankly admit, that as conditions are to-day I have no suggestions to offer, other than the very simple ones which will readily occur to the mind of everyone without my taking the time to mention them.

The only logical solution of the problem of reporting and marketing the honey crop, is that we must change existing conditions. While prices for honey, as for nearly all other products, must always be largely controlled by the laws of supply and demand, yet this is the case to a greater extent, with some things more than others. For instance many varieties of fruit are of a very perishable nature, and in the event of a large crop there is not time for proper distribution. On the contrary, good honey will keep indefinitely, and even if we have a crop no glutting of the markets need take place if it is properly distributed. As it is to-day, a fair crop in one locality will often overload the nearest market, even should there be a comparative failure of the crop in other sections. This will at once bring to our minds, the paramount issue before the beekeepers of to-day—commercial organization. In this age, when the combination spirit is so rampant in the land, that some wag has suggested that, "Ten mills make one trust, ten trusts make one combine," should be added to our tables of weights and measures. I feel that we should be very careful how we move in this direction. I have nothing to offer along this line; indeed it would be presumption on my part to do so, as we are shortly to listen to report from committee appointed to look into this matter. Nevertheless I feel sure that anything that will better the conditions of the bee keeper, and at the same time not violate the principles of the Golden Rule, will receive the hearty support of the majority of the members of this association.

Mr. CRAIG: This subject has been under discussion to some extent in the Canadian Bee Journal during the last season, and notwithstanding this I do not know that anything very definite has been reached. Mr. Byer's very excellent paper has left the matter before us as we all see it. So far as the Journals are concerned they receive their reports or information from the very best possible sources. We are dependent on the directors of the Ontario Bee-Keepers' Association, and these, although they have not been definitely appointed by you to send in their reports, have very kindly and very faithfully given them to us, and we have in turn tried to report them as faithfully, so that every member of the Ontario Bee Keepers' Association and every reader of the Canadian Bee Journal from the Atlantic to the Pacific can know, to a certain extent at least, what is the condition of the honey crop all over the Dominion. Now the trouble, I believe, in part lies with the bee keepers who think they are saving money by remaining outside of this Association, and by not subscribing to a bee journal. There is no doubt that we have had trouble and that the industry has suffered to some extent, at least, from unauthenticated reports in the public press, such as have been mentioned by our friend Byer in his paper. Over these of course we have no control, and I believe that I am right in the statement that the reports sent out by the Associated Press, mentioned by our friend Byer, came from the hands of manipulators. There were post cards received by the leading bee keepers of Ontario, at least, especially by members

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of the Ontario Bee Keepers Association, asking the amount of honey they had secured. Some of the people who had received these cards were foolish enough to reply giving the probable amount of honey they had on hand. They had no business to reply to these cards. If the house that issued these cards wanted honey and a quotation on honey, the person to whom they addressed that card had the right to answer courteously and give them a quotation for that honey, otherwise they no right to give a statement of the amount of their honey. What do we do in case we reply fully to these cards? We leave ourselves at the mercy of these people, and you put them in possession of the facts as to the honey crop of the Province of Ontario from east to west. Now there are some who will say they have not any right to give a statement of their honey crop to any one; that it is not the business of any other individual but themselves. That may be true, but in case our Association wants to report somewhat definitely the amount of honey produced I do not see where the wrong is; but this is not for the public. It certainly would not be handed to any commission house or any other business firm to make use of. I do not know that I can offer anything to remedy the evil any more than what we have before us, or at least what we hope to have before us; that is the matter of the honey exchange, which will come up afterwards and probably settle this difficulty definitely.

Mr. SIBBALD: I am a bee keeper, and on the other hand I am a wholesaler and I know both sides of the question. I don't agree with what Mr. Craig said just now about never giving out a report to a dealer, or that it was not the business of a dealer to ask for a report. A dealer will not buy honey to any extent unless he has a good idea of the crop of the Province. In fruit or honey or anything else he is not going to invest his money in a chance game like that; he has first to get some information about the crop, and then he will go ahead and buy honey. We know as bee keepers it is important that somebody is ready to buy our honey when we are offering it for sale. If we go to the market, and the buyers do not know anything about the crop they will not buy. What are we going to do? That will lower the price just as much as it will to give them the report, and my practice has always been with a dealer, when I first commenced to sell my crop, to give him a fair idea, as far as I knew, what the honey crop and the situation was, and I always tried to get a price that I thought would be maintained by the crop. I do not think the dealer would get ahead of me in the price. If they told me there were big crops I would say, I know all about the crops better than you do. When I sell to a dealer I want him to make a profit on the honey, and I am sorry if he does not. I do not want to have everything myself. The difficulty is one which is very hard to be got over so that the dealer will have a fair and not an exaggerated report of the crop; and I think, with Mr. Craig, if we could have some organization, such as a honey exchange, so that we could get an accurate report amongst ourselves and set a fair price on our product the dealers would have more confidence in us. They would sooner buy our honey if they knew what they were getting, and that they were paying the right price, and that honey was not likely to go away down in price. Next year, owing to the results of the past year, they are going to be more wary than ever about buying honey, and if they buy any quantity they are going to buy it cheap.

Mr. DICKENSON: I have no fault to find with dealers getting honey as cheap as they can. If they come to me and I have a quantity to sell, and am prepared to quote them a price, I endeavor to do so. If I fail to come up to their expectations with regard to price, I think they should treat the matter in a gentlemanly and business way, and send a civil reply. The time I got the reply from the firm in Toronto my honey was all sold, but I was told I had to get my idea down considerably. They simply did not get a quotation from me again.

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Mr. HOLTERMANN: This is a very important question, and I agree to a very great extent, although not altogether, with my friend, Mr. Sibbald. I know a little about a certain firm that we, perhaps, have in our minds at the present time. Last year they sent out for these market quotations, when Mr. Sibbald, I understand, was with them. I had no objection to their sending out these requests, but as to the wisdom of answering it, that is another matter. I don't think it is wise to answer it, and this year I for one did not answer their question at all, but later on they tell me that I must get off my high horse. I was at the Toronto Exhibition, and a very nice gentlemanly person came along and said, "Have you any honey to sell?" I said, "We have a little." He said, "What have you been getting?" I said, "We got 9½ cents in barrels, and I have some left." He says, "That price is too high altogether." After questioning him I found he was a buyer for this firm, and I told him of another man that had a lot to sell. He said, "I will tell you how it is. We have instructions from the Old Country that whatever we cannot buy at 7½ cents we must not buy, because that is all they are prepared to pay in the Old Country. Do you see how beautifully this thing worked? They couldn't buy unless the market was forced down to 7½ cents, and by this report going out through the country, that there was this immense flow, and so much had been offered to them, the tendency would be to depress the market so that they would be able to buy at 7½ cents. There is a warning in what Mr. Sibbald has said as to the dealers buying largely during the past year, and as to what they will do during the coming year. I believe if the commission man or the wholesale man loses on what he buys one year he is going to look out another year. We should not allow them to get our reports in the way in which they have been doing.

Mr. COUSE: There are always two sides to a question. I do not believe there is any set of busines men doing business largely but will try to find out what they are going to buy, and how much there is to buy, and I think they have a perfect right to do it. We are not the only people in the world. Reference was made to a certain house in the city, and I happened to go in one day, and they showed me letters they had received offering honey at certain prices. Why wouldn't they take it? They have to go to the men first that they sell to and say, "What will you give us for this honey?" And these men say, "We will give you half a cent more or a cent more than we can buy South American honey for." They will take one or the other—the cheapest. I was shown a sample and asked what I thought of it. I said, "I think is is a foreign honey." I was told, "We can sell that honey for so much; it is just as good a price perhaps or better than what we are going to sell yours for." These men are selling largely to manufacturers. It is really surprising; I did not know until a year or two ago that the consumption through grocery stores, and in that way, did not amount to much; it is sold largely to manufacturers. They can buy honey where they please, let it be Cuba, California, South America, or any place else.

Mr. HOLTERMANN: Do you justify a man who writes to say, "You have to come off your high horse?"

Mr. COUSE: No; he is not justified in that. You do not have to; although at the same time he may think you have.

Mr. HOLTERMANN: Another man came to Mr. Smith at the exhibition and said another firm in Toronto had been offered by the Bow Park Company all their comb honey at $1.50 a dozen. We had never quoted that man a price; we had already sold our comb honey at $2 a dozen. Does not that indicate that that man was deliberately telling a falsehood in order to get the other man to put down his figures.

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Mr. DICKENSON: I do not think the honey from foreign countries, even for manufacturing purposes, comes in competition with our honey. For instance, the honey that comes from Jamaica and Chile, and, I suppose, from Cuba, is not classed with our honey at all. Our clover honey is a table honey; it comes in competition with honey from California. The price that first-class California honey will bring in the British market you can split in two. Our clover honey from Canada will beat it; and from the other countries I have mentioned the price will not be half as much. It simply does not come into competition with that class of honey at all. It goes in there by the thousand barrels.

Mr. COUSE: I am speaking of the Toronto market. There is real Cuban honey brought into the Toronto market and sold to the manufacturers.

Mr. DICKENSON: If it does not come into competition in the British market why should it in Canada? I am surprised.

Mr. HOLTERMANN: It has done it.

Mr. COUSE: It is doing it today.

Mr. DICKENSON: The samples I have had sent me simply answer for themselves; they have not the quality. They may affect the price, but they are not in that class at all.

Mr. SIBBALD: Mr. Dickenson's idea perhaps is all right in a way; but there is too much of this honey in the market. When the manufacturer is offered honey at eight cents and he tries it and says it suits him all right, that he cannot find any difference, what are you going to do? Jamaica honey was sold in Toronto last spring and delivered here in large quantities at eight cents, and not only Jamaica honey but California honey was brought there, with carloads of fruit, and sold in the Toronto market to manufacturers and retailers. That hurts our market; and if we get our market up higher, and they see the quotations, they send to a broker and ask if he cannot sell some honey for them. He goes around and canvasses the different buyers; they give a sample order, and if they like it they bring on more, and while the other honey is supplying the demand in Toronto our honey stands on the shelf. That is going to lower our market in time. As to what Mr. Holtermann said about my being with the firm at the time those cards were sent out, I might say I am only there six months and I haven't anything to do with the office work at all. If your honey is sent in there, I am asked to report on that honey as to whether it is first-class and what it is worth, and to see that the weight is right, and so on. That is simply all I have to do with it. Those cards were written in a wholesale way, and not intended for any particular person. In some cases the bee keepers' ideas were pretty high. Honey was quoted from twelve cents down to perhaps seven-and-a-half, which shows you the idea bee keepers have of the price they ought to get for their honey. I don't know that there was any particular harm in sending out these cards although the bee-keeper who had not quoted any price or had sold his honey began to wonder what he was at.

Mr. HOLTERMANN: The sending out of these cards had the effect of tending to depress the price of honey.

Mr. SIBBALD: After all, I believe all the dealers paid enough for their honey this year.

Mr. DICKENSON: Do I understand Mr. Sibbald to say we are in competition in Canada with Jamaica honey.

Mr. HOLTERMANN: Yes; that is right.

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Mr. DICKENSON: I have got samples in my house sent from Liverpool, and I get twice as much for one hundred pounds of my honey as what they quote me Jamaica honey will sell for there.

Mr. COUSE: Lots of this honey is being sold for the purpose of putting it in Infallible Oil.

Mr. HEISE: I could have sold all my honey at a certain price had it not been for the fact that they could purchase Cuban honey for a cent a pound less, and as far as I know they purchased Cuban honey. If that is not coming into active competition with our honey I would like to know what it is.

Mr. DICKENSON: I will stick to the Old Country market.

The PRESIDENT: There must be something wrong with the importation of honey if parties can come in and compete, because there is three cents a pound duty on honey coming into Canada.

Mr. HOLTERMANN: I had a letter within the last two months from Cuba asking me whether I would undertake to handle Cuban honey; and I had a sample from there, as far as color goes, just as white as any honey we have in Canada. I do not know what it was from. I am not going to say it was as good by any means, but there are a great many people that use things that are not quite as good. There are even manufacturers that will use honey that is a little thinner where perhaps the better honey would go further, but we have to be able to show them that that is the case.

Mr. HEISE: I might say that the Cuban honey suited them equally as well for their purposes as our white honey.

Mr. BYER: Speaking with the manager of one of our largest manufacturing firms, he had a sample of what he called Jamaica honey. It was beautiful to look at, and he said it answered their purpose just as well as the very best honey they could buy here. He says: "We have had so many tons of that honey laid down here at 7½ cents a pound, and we are waiting for further advices, and if we can get more at the same prices we are not prepared to pay more for Ontario Honey." In three or four days they heard the Jamaica crop was a failure and they paid one-half cent a pound more.

Mr. SIBBALD: I have seen a sample of the Jamaica honey and it was pretty light, but equal to our own honey in color, I think. It had a foreign flavor that we might object to, but I do not see that it would make any difference for use in baking, and that is where it comes into competition with us. I believe half of the honey used is used in manufacturing.

Mr. WHITESIDE: I would like to say a word in favor of the *Bee Journal* which came to my relief when I was in a quandary, by giving reports received from different sections of the country.

The PRESIDENT: I think the action of the executive this year in getting those reports had a very important effect in keeping up the price. There are always in some parts of the Province poor crops, and in other parts good crops, and if we could only get bee keepers to know these things they would not get demoralized and sell the honey too cheaply.

Mr. LOTT: Has anything ever been done to establish a market in the Old Country for our honey?

The PRESIDENT: I think not officially by the Association, but I think Mr. Dickenson and some others export honey to the Old Country.

Mr. LOTT: Speaking of the commission men, for my part I have very little use for them; I can generally sell my honey without leaving it in their hands.

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I had a little experience once. I shipped some fifteen barrels of honey, and when we paid the railroad freight and commission men, cartage, wharfage and so forth, I got very little out of it. I never had anything to do with commission men after that. I think if some steps were taken we could get a good market in the Old Country for honey.

The PRESIDENT: I think the best market for Ontario honey is in Manitoba and the Northwest, if we could only have a proper system of distribution. I think the best way to ship it is to ship it candied in ten-pound pails; the pail itself is valuable, whereas the sixty-pound can has to be thrown away.

Mr. CHRYSLER: Our extracted honey is not all good honey fit for table use —that is, considered the best. It should be graded as No. 1 and No. 2. Our No. 2 honey can be sold at a price to compete with foreign honey coming in here for manufacturing purposes, and it will entirely shut it out. If our surplus is good clover honey of good body and color it can by the Association be distributed, and we can get a larger price for it even in foreign or distant home markets. I think we can get a really good price for our No. 1 extracted, and a price for our No. 2 extracted that will fully compensate us for all our competition.

Mr. HOLMES: I would like to know what is the general advice from this Association to its members relative to this matter of giving out information to dealers immediately when we secure the honey.

The PRESIDENT: I should never report a boom crop; if it was a large crop I would be very cautious, and if it was a failure I would say so.

Mr. HOLTERMANN: It is not wise, if there is a big crop, to try to make people believe that there is a poor crop, because that might result in a good many being disappointed as to what they really will get. We are perfectly willing that there should be a fair report throughout the Province as to what the crop is. That, I think, is a business-like stand, but I do not think that is got by writing to the best bee keepers of the Province and asking them what their crop has been.

Mr. CHRYSLER: If all the bee keepers would give the exact amount of honey produced by them it would not be an estimate of the honey produced in the Province. Each year should be given compared with the year previous, and the number of bees in the vicinity compared with the year previous in order to estimate prices and to get any satisfactory results from the estimate.

The President appointed Messrs. Darling, Sibbald, Gemmell, Byer and Newton as the committee on a question of the revision of the Foul Brood Act.

QUESTION DRAWER.

Q. Does stimulative feeding in the spring pay and in what way?

Mr. CHRYSLER: I do not believe it does. Early spring stimulating is inclined to wear out the life of the bees before the honey crop is ready to gather, and they are not as strong; they may not be stronger than they would have been if they had not been stimulated. Of course there are times when we should feed, say between bloom and clover, that pays well, in order to keep them from starving and keep the brood fed and in good health.

Mr. DICKENSON: I would say that stimulative feeding pays me. I generally have a certain amount of honey I want to feed back. I would like to follow it up; I would not like to start without keeping track of it.

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Q. How to unite light swarms and when?

Mr. CHRYSLER: In August or the 1st of September I just simply go and set one on the top of the other for a few days and get them all in one hive body; if they needed feeding for the winter I could feed them. I would pay no attention with regard to the queens; they would settle that themselves.

Mr. DICKENSON: Unless you knew one queen was better than another?

Mr. CHRYSLER: Oh, certainly.

Mr. BYER: Would not a number of the bees go back to the one stand?

Mr. CHRYSLER: I wouldn't care very much for that.

Mr. MCEVOY: Did I understand Mr. Chrysler to say he would simply set one on top of the other and unite them?

Mr. CHRYSLER: I would set them on top of one another and let them be like that for a few days—

Mr. WHITESIDE: Till you feed them up in the fall.

Mr. CHRYSLER: Yes. And I would come along again and dispose of the frames not occupied and get them all into one hive body; they would be one colony then.

Mr. MCEVOY: I would get the bees to fill themselves pretty thoroughly upon their own stand, and do the work in the evenings along as late as I could do it, and then unite them at once. I would raise the hive two or three inches on the bottom and shake the bees down, and let them run in and give them a fair smoking, so that it would knock all the fight out of them.

Mr. HOLTERMANN: The Inspector has a number of different times told us what we were to do with the bees in the evening. A good many people don't know what that time is. Is it after the bees begin to crawl up your sleeves and so on?

Mr. MCEVOY: I thought you all understood that evening was along sometime about sundown; just a little before dark.

Mr. NEWTON: I would endorse Mr. Chrysler's system, only doing it in the evening; but I do not want to smoke them I generally lift them up, and put a board between them and leave them, and I think the job is done.

Mr. ARMSTRONG: Do you not have some killed in that way?

Mr. NEWTON: I have never noticed a hive where they fought and killed one another.

Mr. ARMSTRONG: I had one this fall in which I did what Mr. Chrysler says. The next morning I was passing along, and I saw there had been a general fight; the whole front of the ground and the entrance was filled full of bees. I would take the Inspector's plan. If I was going to unite any time in the afternoon, I would bring the two colonies together and put an upper story on to shake the bees into, giving them first a thorough good smoking so that they would fill themselves up, and take the fight out of them; then I would take them, comb after comb, and shake them right down in the top and give them a thorough good smoking on the entrance and put the cover on, and everything would be all right the next morning.

Mr. NEWTON: Do you use a metal board between two stories when you unite them?

Mr. ARMSTRONG: Sometimes we do and sometimes we do not; it depends on whether I want to get hold of the queen.

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Mr. HEISE: I go to the hives I wish to unite and remove all the frames except just what the bees occupy. I do that one evening, and the next evening I come along and generally lift three out of one hive and place them in the other, leaving space for one frame between. I let them remain thus for three or four days or a week, and then I put the frames together, and I have never noticed any fight.

Mr. MILLER: There is a difficulty with some of us being able to attend to those bees in the evening. We should have a method whereby we can do it at any time through the day. I have found a very successful method by adopting partly what has been said, and taking a short cut. I would smoke both hives well, carry the one up to the other, and if I did not choose to remove the frames I would leave the body and give it a shake in front, and I would set one right on top of the other any time of the day and set up an entrance board at the entrance. I never had any difficulty with fighting or bees being lost.

Mr. SIBBALD: What is the advantage of uniting?

Mr. CHRYSLER: The advantage would not be much with a large bee-keeper who has lots of bees but there are some cases where bee-keepers wish to winter over all the colonies that they possibly can for the next year, and the chances are that he has a number of young queens in each one. The two united will raise enough brood to enable them to winter very safely, whereas if they were left as they were previously they had not enough bees to winter very safely. If I thought they would safely winter over I would never unite them.

Mr. HOLTERMANN: Could you winter a two-frame nucleus with safety?

Mr. CHRYSLER: I might. I have wintered them with three; I have not tried two.

Mr. FIXTER: Which hive do you have your swarm in, top or bottom?

Mr. CHRYSLER: They would be in both a great many times. If they are small swarms they will have a certain amount of empty frames, and I put those together that had bees on them.

Mr. FIXTER: You would have to fall back on Mr. McEvoy's plan after all to shake the bee's into one hive.

Mr. CHRYSLER: I would not shake them; I would just set them in.

Mr. FIXTER: Why not do that at once?

Mr. CHRYSLER: I do not know; I practiced the other. It might work all right in cool weather, but I would not think it would in warm weather. I think there would be fighting.

Mr. LOTT: I have caged both queens, and shook the bees into the hive, and the next day you could take out either queen you liked; or the day following you could liberate the queen and they would not fight at all. The time they get fighting is when they have liberty to pile into the queen. If they cannot get at the queen to fight it will not set the bees going.

Q. What is the best way to feed colonies which have been put away too late, no combs being available?

Mr. CHRYSLER: There is a mistake in not feeding in the fall, but I would make cakes of candy and put over the frames; but at the same time that will not answer wholly if you have not got a fair quantity of honey in the hive.

Mr. LOTT: Would you disturb your bees after you had once put them in the cellar and fed them candy?

Mr. CHRYSLER: It is always a detriment to safe wintering to go tampering with them afterwards; but if cakes of candy are placed over the frames it does

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not disturb them but very little; it will add to their dryness too, I have found, and if you have honey below, the moisture of the bees that rises will, to a certain extent, help to liquify the candy.

Mr. BROWN: Did you find them taking down that candy all right?

Mr. CHRYSLER: No, you cannot expect them to take it all down in all cases, but it is to get them through the winter.

Mr. FIXTER: How would cakes of maple sugar do on top?

Mr. CHRYSLER: I do not know about that. There is probably more saccharine matter in that, and it might act as poor food.

The PRESIDENT: A neighbor of mine had a box hive, and it was too light and he bored a hole in the top and got an empty sheet of comb and laid it on top close to the hole, and made syrup—just ordinary feed; and every little while he went down into the cellar and dipped a little of that into the comb, and the bees came up and took it down and they came out good in the spring.

Mr. CHRYSLER: I might say I had two colonies one year that had been fed all winter; they came out splendidly in the spring, but before the clover was on they were not worth anything. One had lost a queen, and I just managed to save the other one, and it did not seem to amount to anything compared to others. Those were fed with liquid honey and had a small top bar feeder.

Mr. LOTT: I am beginning to think my friend does not live as far north as I do, where we have it twenty degrees below zero.

Mr. DARLING: I put the question in. The reason I did so was that I got word on Saturday that there was a merchant up in the town wanted to see me. I went, and it seems some acquaintance of his off some thirty of forty miles put some bees away too light, and wrote to him wanting to know how to manage them. I do not know whether they have combs or not, but I presume they have. I do not know whether the frames are moveable frames or box hives.

Mr. CHRYSLER: If I had combs of honey I would lay them flat over the top of the frame the same as I would the candy.

Mr. DICKENSON: This discussion has all reference to bees wintered in the cellar.

Mr. FIXTER: We have dozens of letters come to us, as Mr. Darling has had, how to winter colonies that have not sufficient stores. I have had colonies worth very little, weighing about thirty pounds apiece, and I have put from four to six sections on top, and we find them come out very well. We took care in covering the top considerably so that there would be no ventilation.

Mr. HOLTERMANN: We are to take it for granted he has not got any comb to give them, Wintering in the cellar, the way I would do with either a box hive or otherwise, I would take as flat a feeder as I could get and give thick syrup. If I had nothing but a pan I would put straw enough to keep the bees from drowning; raise the hive very quietly off the bottom board and shove the feeder in under the combs and let them take it up. I do not know of a better way of doing it. You can do it quietly, and you do not need to disturb the top of the hive where the bees are. But if the bees had even two pounds or three pounds of honey in the combs in a good cellar I would run chances, and leave them alone till I took them out, and mark them, and immediately attend to them afterwards.

Mr. MCEVOY: Did I understand that you would feed them syrup or liquid in the winter under the hive?

Mr. HOLTERMANN: Yes, I would not be afraid.

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Mr. McEvoy: Towards spring that would be all right, but to start that early in the winter they break cluster, and they become restless.

Mr. Holtermann: That is why I do not want to adopt that system, but practically a stock will come down and take it and go right up again.

Mr. McEvoy: It should be started along early in January. But if you have got a poor class of sections that would not cell put them on top, as Mr. Fixter says; of the two I will secure more safe queens by that system than I will by the other.

Mr. Armstrong: For my part I would put on good thick syrup with the Canadian feeder, and pack the feeder down all solid. I fed bees in every month in the year except February and March. I fed one colony one year buckwheat honey in January that had not enough to winter, and it was a fair good colony when the clover came in.

Mr. Lott: Is that in the cellar?

Mr. Armstrong: Yes, or outdoors either. If I had room enough on top of my packing case I would risk it there.

Mr. McEvoy: That would work well with one and would not with another. Mr. Armstrong is one of the best bee keepers in the Province of Ontario. He is a specialist, and when he will feed a hive, it will be a hive worth feeding. But take an ordinary farmer who has got a hive of bees pretty light in stores, and is likely light in bees, and his bees will not come up to the feeder, and they will not do as well as Mr. Armstrong's.

Mr. Dickenson: I would not like to recommend feeding ten months or eight months in the year.

Mr. Armstrong: I do not recommend it either, but I have done it. In case of necessity, where you think a colony is going to starve, do you not think it would be better to do that?

Mr. Dickenson: No.

WHY I AM A BEE KEEPER.

By W. J. Brown, Chard.

I am a bee keeper, first, because of a natural fondness for honey, a fondness that never relinquished its hold, and I never expect that it will. I remember when I was a boy of how I used to rummage the wild bumble-bee's nests, even to get one drop of sweet nature, and it made my heart glad. As manhood advanced so also my ideas; so then to my joy a box-hive of bees I then bought.

My second reason for being a bee keeper was that my instinct of nature led me on to search and if possible find out the mystery of the mysteries connected with the honey-bee. In those primitive days—at least primitive they were to me, as I had not the opportunity of studying standard works on the honey-bee and bee journals galore as my fellow bee-keepers, have to-day; yet every moment and every hour of my time that I could possibly spare from other pursuits was taken advantage of in the study of my little workers, and thus added to my joy and knowledge.

My third reason for being a bee keeper was the great pleasure of having honey (nature's sweet) on my table three times a day the whole year round, and at being able to treat my friends and neighbors to a feed of honey when they come in, and at hearing the hum of the bee in the apple tree, clover field, and elsewhere.

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My fourth reason for being a bee keeper was the "financial" side of the question, as I had an idea at one time that there was more money in bee keeping than any other line of business on the face of this broad earth. But, while taste for honey is as keen to-day as ever, and my appetite for research in the mysteries of the honey-bee is as ravenous as it was a quarter of a century ago, and there is little even yet affords me more pleasure than to be able to treat my friends and neighbors to a little honey, and to hear the merry hum of those dear little honey-bees when they are in the clover and buckwheat field, I must say that I am slightly disappointed in my fourth reason for being a beekeeper,—viz., the financial side of the question. True, with proper care and management on the part of the manipulator, there is money in bee keeping, but for the one who has made a pile out it a dozen have made a failure. For my individual part, I have nothing to complain about in having taken it up as a pursuit as I like the honey, I like the bee, I like to work among them, and I like to see the dollars come in as the result of my being a bee keeper.

Mr. HEISE: I think the reasons he has given as to why he is a bee keeper would probably cover the reasons most of us are bee keepers. The financial, I believe, is the greatest reason perhaps when compared with any other why we are in the business. I know it is the case with me, although it affords me a great deal of pleasure as well. There is probably one other reason which Mr. Brown has not mentioned why we should be in the business as bee keepers. I think our good Presbyterian friends say that the first aim and object of man should be to glorify God, and possibly that should be our first aim and object in entering into the bee business, and the financial part might come secondarily.

SPRING MANAGEMENT.

By R. F. WHITESIDES.

If the roofs or gables of hives that stand out all winter have cracks through which snow drifts as it piles up against them, it is well, about the first or second week in March, to examine them and shovel out the snow before it melts.

If hives or clamps are completely covered, shovel down to the fly holes, or at least to the bottom of the gables or eaves, and so keep open while snow lasts, as strong colonies are breeding, and much more liable to become over-heated than in January or February.

According to Ernest Root's late experiments, brood rearing is much encouraged if bees are set out of the cellar once or twice in March a day or two at a time, when we have nice sap weather, bright and warm, as it affords them a cleansing, stimulative flight.

It is not advisable to leave bees out for good until a few experimental hives left out all winter begin to gather pollen, say about April 15th. When one has all the bees they care for, and swarming is not desired, the top boxes may be placed on during apple bloom, two or three brood combs being placed in the super after shaking to make sure of the queen.

McEvoy says if one or two heavy combs are uncapped and placed in the super it encourages the bees to store above. Where zinc is used it might be as well not to place it on until after the first extracting, being careful to keep all drone comb as far as possible from the two brood combs. Baldridge, and I think also the Coggshalls, place only a few combs above at first if colonies are weak, adding combs as the season advances. His stenographer tells me he unpacks during apple bloom, and exposes the honeyed combs in dead hives if the live ones need feeding. This year I was scared by reading two reports in our

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Bee Journal regarding the large amount of honey consumed during winter, so I spent about a week examining every hive. One was found completely starved and another on the verge the first day, but none afterwards. However, it paid, as some would probably have starved if they had not been equalized and fed.

In any case as soon as snow is all gone it is well to clean out all dead and hopeless hives, and expose the combs to be robbed out, whether the survivors need feeding or not, and the combs in said hives should be left an inch apart and uncovered to prevent millers.

If top stories are placed on early, care should be taken to stop all cracks and air holes, and the winter cushions should also be left on.

If any are weak, having say only 15 or 20 in brood, and possibly a queen, they should be placed in a hive having plenty bees but queenless, or a drone-laying queen. If none such are found, open them up as though completely dead, and have done with them.

The bee man who has out-yards should have a few mailing cages in his pocket, supplied with good candy or candied honey for caring for the above good queens.

If bees swarm out, clean up their hive and give them a comb of brood and also a comb of honey if needed. This trouble is also said to come from too much contracting in the fall. One fine April day a man had 40 leave their hives seemingly on account of too small hives. Spring is also a good time to kill ants, which also cause absconding. One bee man shoves a shovel into their hill, shakes it back and forth making a wedge shaped hole, into which he pours a pail or two of hot water. Save the water washing days, and give them two boilers full a week till they are all done. Also turn over every flat stone and chip and dose them also. Move every hive and clamp, too, if you wish to make sure; and then in a year like this there will be plenty of left to perpetuate the species. Some use powdered borax or turpentine to exterminate them. Sometimes they get into ten-pound pails of honey, if lids do not fit perfectly, and suspicious tins, and in fact all tins should be examined before shipping. If kept till spring, to encourage weak swarms, Mr. Rogers used to place a large hot stone on the frames morning and evening. But the game was not worth the candle. Contracting and cushions will answer, but we should be on the alert or first thing we know those doubtful ones will cast a swarm. Some feed artificial pollen, ground rye or oatmeal, but Doolittle says they will appropriate a pollen comb if placed near the cluster, and he ought to know.

One day a neighbor happened over, and on looking over the bees a few of them were quite busy, and on closer scrutiny they presented a very ancient appearance, so much so, that I remarked it. After some deliberation he said he had just come from another yard half a mile distant, where they were feeding artificial pollen, and so my bees were reaping the benefit.

Re-uniting weak colonies may sometimes pay if you bring one of them from an out-yard, but not otherwise. Bee-keepers whose time is limited will do well to adopt all good short cuts; so if clipping is to be attended to it can be done when top stories are placed. In order to make sure you are not putting the queen above the zinc you should see her, and then having your clippers ready the two jobs can be done at once.

I imagine a novice might occasionally hurt a queen in handling her by the wings or thorax. The Monet receptacle would obviate this. However I like the looks of the small crotched stich with a light rubber cord stretched across the ends of the "Y." Clip one wing this season, another one next, and her head the next.

If bees hang out before placing supers, enlarge the entrance to 2x6, if necessary, then have a tin with a fly hole 2 inches deep by 3-8 inches wide for contracting and winter.

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Some use a shallow story for fruit bloom honey, and place them over the deeper one when clover yields. These can be also extracted and filled again with buckwheat honey and left on all winter. Root says a single board hive with no cushion on is more liable to dwindle than one thoroughly packed on sides and top.

In setting out bees, Doolittle takes three days to it, commencing about 3 p.m., and setting one on every third stand each day. He has an outside door and a spring wheelbarrow, and uses smoke immediately on loading the hive, or they would run out and sting fearfully. When he smokes them in he places a block to keep them in till set on the stand, but I would place a block or stuff up the fly hole with old wool before I handled them at all, and pass along and pull it out when done, setting them out if I did not forget to. He also moves centre combs of brood to the outside of the cluster every week after they commence gathering pollen, and so has eight frames of brood for fruit bloom and a roaring colony for clover honey; but it does not pay to get them up so strong if fruit bloom do not yield a surplus. He makes sure to always have plenty of honey in the hive.

To busy farmers, who keep from 20 to 50 hives, I would say do not do a tap to your bees in the spring, if you can manage it so. If kept in a cellar of course you must carry them out when the snow is gone, say about April 15th.

Mr. POST: Mr. Whiteside's paper was more, I think, on the outside wintering of bees than spring management, and there is nothing very definite in the management for the outside. Do you allow cracks in the hive outside, Mr. Whiteside ?

Mr. WHITESIDE: They seem to get there pretty often.

Mr. POST: I have my hives packed with four inches of sawdust, tight and dry and good cushion on top for outside wintering. I think, in his remarks, he says he separates the combs early in the season, and places dry or empty combs in the centre of the brood nest. I do not think that is right in the early part of the season; it would not answer in my locality. I do not want to shift the combs, if I do it at all, until just the approach of clover-yielding honey. As far as wintering bees inside is concerned, I do not think he differs a great deal from me in carrying them out. You carry them out after the snow is gone ?

Mr. WHITESIDE: Of course; I quoted Root.

Mr. POST: I do not believe in carrying them out in March. I do not think that would work with me at all; I like to keep them in, and keep them as quiet at possible until they are set out for good,

Mr. GEMMELL: Have you never set bees out in March ?

Mr. POST: If I set them out in March they are to remain.

Mr. GEMMELL: I have, as an experiment, placed them out in mid-winter.

Mr. POST: There were some remarks made about destroying ants and so on. I never thought of killing an ant in my yard; if the yard was covered with them I would not kill an ant on account of it doing bees harm. I never saw ants do the bees harm.

Mr. BROWN: Perhaps the difference in localities would have quite a bit to do with it. It is altogether likely the locality of the writer of this very fine paper is further south than that of the last speaker. I am sure he must be further south than I am; otherwise if he set them out in March he would not have very many to carry back in again. The ground is usually covered with snow in the month of March, and I think if the bees were carried out of the cellar they would be very apt to make a rush out and not come back again. If

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they were wintered outside it would be all right, but to carry them out and give them a fly, and then carry them back, is a thing I would not approve of, in the northern part of Ontario. With regard to setting the centre of the brood nest to the outside of the hive in the spring, I certainly would not approve of that. I I would try and hold as much of a brood in the centre as possible. As to setting on supers during fruit bloom, in our part we have very little fruit bloom, whatever there is, it is too cold and wet and windy for the bees to get to it, and consequently we never have any surplus honey from fruit bloom.

Mr. FIXTER: Did I understand the gentleman to say that April 15th is about the right time to set bees out?

Mr. WHITESIDE: Yes, I find April the 15th about the time.

Mr. FIXTER: I could not agree with you; I think that they ought to be set out a great deal earlier. We are about as far north as Mr. Brown, and we set them out on the 22nd March this year, and they have done very well. For many years we have set them out when there was a foot of snow, and they have done very well. We do not believe in leaving them in the cellar too long. He also said during the winter you should shovel the snow off. Wouldn't it be much better, in a place where there is so much snow, to keep them inside in the cellar.

Mr. WHITESIDE: This is more particularly for out-yards. There would not be room in the cellars and you would not want the bees in there; it is bad enough to have them outside. Personally, I have no choice.

Mr. FIXTER: Then he speaks about the frames that the bees have left during the spring. With those frames would it not be better to keep them in the dark so that the millers would not get at them?

Mr. WHITESIDE: There are cellars you can keep them in, but it is the exception, not the rule. As far as my experience goes a cellar is a poor place for pollen combs.

Mr. FIXTER: By setting your bees out and taking three or four days to do it, have you ever found any trouble with the bees going together?

Mr. WHITESIDE: I quoted Doolittle on that. I thought it was a very good plan when I read it; better than putting them all out at once.

Mr. MILLER: The time of clipping queens was mentioned, if I understood rightly, as being done at the time of setting on the supers. With the majority of us, I am afraid, we would get sadly behind if we left the clipping until the hives became so populous, and attempted to do it at the time of putting the supers on. I like to clip in fruit bloom.

Mr. DICKENSON: I agree with Mr. Fixter with regard to setting out the bees early; still I think no member of this Association should give any certain date for that; I think locality has quite a bit to do with it. With regard to snow being on the ground when the bees are put out, some seasons it is almost impossible to get them out when they should go out without having snow on the ground. I have found it a good idea, if I thought there was any danger of the bees flying and dying on the snow, to sprinkle a coat of straw on the snow.

Mr. MCEVOY: Mr. Whiteside said one thing that I think every person should pay more or less attention to—that is, bringing the cages into the bee yard. If you take a little granulated sugar and honey and mix it into a candy and have it in a cage, sometimes you will find a fine young queen that might be robbed out, and you have got other queens that you would rather do away with, and if you have the cage on hand and catch that queen and cage her it is a good thing.

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Mr. PETTIT: I would disagree with Mr. Miller in the matter of clipping queens in fruit bloom. I find if I wait until fruit bloom, with a good many colonies they are pretty populous. I like to do it the first favorable day when the temperature is high enough and the bees are getting a little honey. Get at the clipping just as early as possible, and you can make a great deal more speed and get along better. Then as to the snow, I set out a great many this year early in March when we had that warm weather, and I could not see any difference between those and the ones I set out later.

Mr. DARLING: Two or three years ago there was quite a lot said at our convention about setting out bees early, and it chanced to be a pretty nice March, and I set out about ten colonies in the fore part of March, and I put out the balance of the bees on the 26th. For some time I thought those set out earlier were going to be ahead of the others, but when it came time for the honey season every one of them were weaker than those put out later on. But I think with the majority of those who have spoken it is not proper to keep the bees in the cellar too long. One thing I have noticed, if the bees come out of the hive with a rush they get over each other and tumble into the snow and water that may be near. If you can get your bees out slowly and naturally as they would fly, there are very few bees die on the snow that would be of any benefit if they got back to the hive. There was a good deal of emphasis put on the fact that we ought to have a certain kind of a day and a certain kind of weather and the wind in a certain direction, to set our bees out. I got fooled on that two or three times, and once or twice I thought I was so sure of knowing what was going to be the next day I put the bees out the night before, and probably they stayed in two or three days before they came out, and I couldn't see the bees were one bit the worse for having been set out. If they are set out in the evening so that they don't rush out and get the air, the next morning they will come out quietly and civily as bees ought to. I think I made a mistake in keeping the bees in too long. I do not like the wind when the bees are flying.

The PRESIDENT: In remarking to Mr. Hall that those in the cellar did not build up so fast as those outside, he recommended taking them out earlier. The difficulty was the bees in the cellar did not get any water, and until they got a drink they did not start breeding. I find it a good thing if the weather is suitable; but the weather is not always the same each year. Some years it is advisable to take them out a couple of weeks earlier. As far as fruit bloom is concerned I like to have my super on as soon as it starts. I have probably three hundred acres of fruit around me, and they make considerable surplus that tides them over without feeding between fruit bloom and clover. It depends a good deal on locality.

Mr. DARLING: With regard to setting bees out earlier, I think there is either a difference in the bees or a difference in the cellar one season with another, or a difference in the feed they have been having. I have put out bees quite late in the spring, and scarcely a colony starts to breed. I have put out the bees in good time, and I would not open a colony that did not have young bees crawling over the combs. That is something I cannot explain, but invariably the colonies that have young bees crawling over the combs when I put them out, without some accident, are the best colonies when the honey season comes.

Mr. HOLTERMANN: In this matter of putting bees out in the spring of the year, I used to keep them in until the 15th of April, but after testing them year after year I became more and more satisfied that early setting out is a desirable thing. When we are dealing with living things; for instance as we had Mr. Darling here with six or seven colonies, the conditions of the colonies sometimes

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vary so much we have to be very careful about coming to a conclusion; and where you would have only six or seven colonies taken, and perhaps a test for a year or two, I say that that may be of very little value. But as soon as the bees are able to get a good fly any time in March I always set them out. I remember in *Gleanings* last year Ernest Root was making the great objection that there was a snow storm in a certain year at a certain date. That did not hurt them any; they were staying quietly in the hive, and it was not doing any harm. The time when the harm is done is when the sun shines brightly and the winds are cold, and when they go out they are chilled. So that I believe any time in March, when the weather is favorable, will do to set them out. Any other locality, the Upper Ottawa and so on, I would not speak for, but I think the true principle is to set bees out earlier in the spring than we have been doing in the past.

Mr HEISE: The remarks made with reference to clipping queens both by our friend Mr. Petit and Mr. Miller possibly applies where bees have been wintered inside. There are a number of us who winter outside, and have our bees packed with leaves, and we do not like to remove the packing before fruit bloom. About the 24th May I generally do so; it varies of course in different seasons. It is an easy matter for those who set their hives out of the cellar to get at them and clip the queens. It is not so easy for those of us who winter outside. On the other hand again it may be a peculiar thing, but I have noticed time and again that in a prosperous colony in good condition and quite populous you will find the queen easier than you will in a very small one. About the time of fruit bloom I prefer to do the clipping, and then remove the packing as well.

QUESTION DRAWER.

Q: Would you advise packing to be put over the cellar-wintered bees when they are taken out in the spring?

Mr. MILLER: I tried that for some years, when I wintered in the cellar, and at that time I thought it was a great advantage. But like a great many other things, as we go on, I am now undecided whether it was or not. I never wintered indoors but that I packed, until the last couple of years, when I quit packing in the spring, and I can see but very little difference.

Mr. SIBBALD: I would endorse what Mr. Miller says; it is my own experience. I do not put anything on now in the spring after setting them out.

Mr. DICKENSON: I spring-packed one time, but I have given it up; I have got cases and do not use them. I do not find any advantage.

The PRESIDENT: If you have a telescope-cover hive that does not sit quite down the bees will be colder than if you had a flat board that lay on top of the quilts.

Mr. DICKENSON: I have a half story. I cushion them up and cover them over—I put four or five thicknesses of newspaper; I use newspapers altogether.

Mr. HOLMES: Five or six thicknesses of newspaper, as you intimated, if the politics are right, is a great help to it.

The PRESIDENT: What cover does Mr. Sibbald use?

Mr. SIBBALD: I have a flat board, that is all.

Q: What is or may be the reason for a large number of bees being on the grass around the hives during the buckwheat flow.

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Mr. MILLER: I have never had any experience with buckwheat—have never been in a location where we get it, so I could not answer.

Mr. PETTIT: Some say that buckwheat honey acts as poison on some bees.

Mr. BROWN: I am in a district where buckwheat is sown considerably, and I never noticed any very great difference, except that the bees did not lie out as much on the grass as in the clover flow when the sun was hot.

Mr. POST: My experience is the same as Mr. Brown's. I never saw any difference between buckwheat and any other flow, but you will see a colony occasionally that crawls out, and there are a great many bees at the entrance, and I think they call it bee paralysis.

Mr. HOLTERMANN: I had a case. I went to one of the out-yards this fall and there were a great many bees lying around in the grass. It had been a foggy morning; the bees worked late in the afternoon and got a little chilly, and they lay there until the next morning and they came to and were all right. I think that would account for it in that case, that they were coming home rather chilled and dropped short of the hive and stayed there until they warmed up next morning.

Mr. HEISE: I put in that question. This last fall during the buckwheat flow I happened to walk through the home-yard one afternoon, and I saw a large number of bees in front of a dozen or more hives and I expected fully it was as Mr. Holtermann said, that they had got chilled, and I thought perhaps after resting they would go back in the hives. They failed to do so. The next day was a foggy, cool day, and they remained there in the grass all day; the following day turned out warm, and before night most of them had succeeded in getting in the hives or somewhere else. I went to the other yard as soon as I saw this, only about a quarter of a mile away, and there was nothing of the kind in that yard. I went there the next day and there was nothing of the kind, and I never did see anything in the other yard, although it occurred three times in the home-yard during the buckwheat flow.

Mr. HOLTERMANN: Was the grass a little longer?

Mr. HEISE: No.

Mr. BROWN: Have the outside yards the same chance of getting at the buckwheat as the other?

Mr. HEISE: Yes; the home-yard is considerably shaded, and the out-yard has no shade; that may be the reason.

Mr. POST: My remedy for a colony of that kind, if it is in the early part of the season, is re-queening, but if it is as late as the buckwheat flow, and there would be no chance to get brood from the queen, I would not bother with it; I would break it up.

Mr. HOLTERMANN: That is the case of where there is disease.

Mr. GEMMELL: Do you not suppose they were gathering something else besides buckwheat about that time?

Mr. HEISE: Not that I am aware of.

Q: How will I take care of my extracted honey after it is extracted?

Mr. MILLER: I prefer putting it into cans or barrels, if it is ripe when extracted. I have never found that leaving it exposed benefitted it; then store it in a dry warm place.

Q: Would an apiary, close to a railroad track, suffer from the noise of passing trains?

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Mr. MILLER: I would say not to any appreciable extent. I think the bees would become accustomed to it; I do not think the noise would trouble them.

Mr. NEWTON: I would say no to it; only sometimes they affect the train men.

Mr. LOTT: I have seen frequently, along the C. P. R. track, where bees have been lying dead, dozens of them. I noticed it this summer more than ever before, that the express would strike the bees in the honey time, and kill them, or run into the swarm and raise havoc with them.

Q: Will bees winter successfully in the cellar, described by Mr. Bingham, of Michigan?

Mr. MILLER: I know nothing of that method more than what I have read. It seems like a feasible plan for indoor wintering; it gives good ventilation.

Q.: What is the best method of freeing brood combs of an over abundance of pollen?

Mr. MILLER: I think if the brood combs are moistened and allowed to stand the pollen can be shaken out very largely. I have not practiced any other method.

Mr. GEMMELL: Why not give them pollen early in the spring before they gather any? It would save your comb and a lot of trouble.

Mr. MILLER: We get plenty of it in the brood nest; it is only in the extracting comb this could be mentioned. I throw water in my extracting combs, and after it stands a time it ferments.

Mr. GEMMELL: I have given them a fine spray and let them stand, and then put them in the extractor and you get nearly all the pollen out.

The PRESIDENT: Do bees use pollen given to them in the spring that has been in the frames all winter?

Mr. MILLER: I think so, if it is not mouldy.

Mr. DARLING: Put a comb filled with pollen down where the brood can get at it, and in a little while it is filled with brood and it is all taken up.

Q.: Will toads kill bees in a bee yard?

Mr. MCEVOY: Yes.

Mr. MILLER: I have had no experience. I have no doubt they would if they had the opportunity.

Q.: Have any persons found quite a quantity of dead brood in the hive a few days after it has cast a good swarm? If so, what is the cause and what is the result?

Mr. MILLER: I have had no such experience.

Mr. DARLING: I put the question in. This year I had just one such colony, and it looked so bad I examined it to see whether the queen had hatched, and I found a lot of dead brood. Of course I have my own theory as to what caused it, but it was so bad I thought it was a case of foul brood. I examined it a few days after, and the colony built up, and it is all right now.

Mr. HOLTERMANN: Did the weather turn pretty cold almost directly after?

Mr. DARLING: I do not remember about that, but my thought was that the bees had swarmed a little too close, and that the brood had either chilled or starved out.

Mr. MORRISON: Was there a shortage of the honey flow just at that time?

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Mr. DARLING: The honey flow was short most of the summer with me.

Mr. DICKENSON: I account for it by turning the hive around too much; that is, the old colony. It is simply this, all the bees are checked from going in—going in and out and carrying water and honey and pollen—you don't get the bees back again; they go into a new colony. But if you will turn the hive around after you have hived a swarm I think there will be no dead brood.

Mr. DARLING: I set this in a new location; I moved it ten feet away.

Mr. DICKENSON: Not for a few days unless you adopt another system.

Mr. DARLING: I think I did it the next day or the day after.

Q.: Is it advisable to wire foundations in frames in the brood nests?

Mr. MILLER: My frames are small, only five and three-eighth inches in depth, yet I think it advisable to wire; by that means I use a lighter foundation. I use section foundation for my brood frames, and then wire very substantially. If I were using a deep frame I think I should find it advisable to wire.

Mr. BROWN: Would you consider the wire would be any detriment to the bees? Would it bother them any? Would they gnaw the foundation?

Mr. MILLER: No, never; it is imbedded, and they never attempt that.

Mr. BROWN: I notice when I happen to get a comb broken by accident and put a hole in it and a string to keep it in place, and set it in the hive, the bees will cut and gnaw and work till they get the string cut off, so I did not know but perhaps they would act the same upon the wire if they could. They might be working at the wire quite a while, and yet you might not notice it or see it.

Mr. MCEVOY: About how much more would you consider one hundred colonies worth with the combs all wired in the brood chamber than the same number not wired.

Mr. MILLER: If it was in the hive I did not want to transfer I would consider them worth a dollar a colony more, easily, if I had to continue to use them. If I were going to dispose of them I would lose that much honey.

Mr. MCEVOY: I would give more than one hundred dollars.

Mr. GEMMELL: Mr. McEvoy was a great admirer of frames without foundations some years ago, but now he has come to the conclusion that wire is a great benefit. I have wired thousands of frames, and I never found any difficulty from the bees gnawing. Mr. Brown tied a comb with a piece of string; that is a different thing altogether; the bees cannot gnaw the wire out.

Mr. MORRISON: If Mr. Brown had had his frames wired he would not have had the broken comb to fasten with cord.

Mr. BROWN: I do not know with regard to that. I have been extracting for at least twenty years possibly, and I have wired practically none, and I think I have got as few broken combs probably as those who wire; excepting the comb falls out of my hands by accident it is very seldom broken. There might be something with regard to extractors breaking combs, but when we come to find out the cause of it it was because the basket in the extractor was too weak, and consequently would sag and let the combs break. There I suppose wired frames would be all right.

Mr. MCEVOY: You take a Langstroth frame and put seven strands of wire up and down, drive little copper staples into the bottom and top and lace it up and that comb never gives. Some of these other combs sag a little, but if you just take and hold them along the light you will find the sag. The queen will

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reject these, and you will find more honey along the top bar, and the closer you can keep the brood to the section or extracting comb the more honey you will get for surplus; besides you can use a little thinner foundation.

Q.: What is the matter with tiering up of hives previous to the main honey flow with the object of securing a large amount of brood? Please describe the method?

Mr. MILLER: That would depend upon the hive you would use. There are a great many things to be taken into account. With my brood chamber I used two of those small brood chambers—the Hedden—for one colony, and occasionally I used three I like it very well in some cases, in others I do not. My two are equal to ten Langstroth frames, but any I use for brood I always wish to leave for the brood nest and not put back with the extracting comb, because it darkens the honey unless the combs are washed.

Q: On an average how many colonies would you recommend for one yard?

Mr. MILLER: That largely depends on a man's method of handling; if he wished to have one day's work in the yard, whatever he could handle. If he had out-yards and had two men going to the yard you could increase those; but for an average I should say not over one hundred and fifty.

Q: Is there much danger of having colonies too strong for wintering?

Mr. MILLER: I have never made a practice of destroying bees in the fall or shaking them off the combs.

Q: Do you think formalin will kill foul brood spores?

Mr. MILLER: We had a good deal of discussion on that. I do not know that I can add to the enlightenment of the bee keepers on it. Prof. Harrison will be able to give us something on that.

Q: How much entrance space should be allowed in wintering full colonies outside?

Mr. MILLER: I leave an entrance bridge four inches wide and about eight and a half inches long, and I take a block about 7½ inches across the front of that, leaving an approach open for my colony of about 1½ by ½ inch on the outside entrance.

Mr. HOLTERMANN: Did you ever try leaving it one bee's space wide?

Mr. MILLER: No, I never have.

The PRESIDENT: That is the entrance to the outer case?

Mr. MILLER: Of the outer case, giving a bridge piece of four inches to the hive; that bridge piece is entirely open.

Mr. CRAIG: Does 8½ inches mean the whole entrance of your hive?

Mr. MILLER: The entrance to the hive would be a ½-inch the whole width of the hive, but my bridge piece is a strip with a two-inch piece at each end, leaving four inches, in all 11½ inches; then I place a block at the outside.

Mr. HOLTERMANN: Jacob Alpaugh has a way of adjusting an entrance which I tried for some years. He had a bridge about four inches wide put at the centre of the hive, then there was a piece of paste board put between that bridge and the front of the hive; that pasteboard had just simply a notch cut in it sufficiently large for one bee to pass through. When he packed his bees the leaves were put in each side which closed up the entrance; across the rest of the hive were forest leaves. The bridge was high enough so that when the pasteboard was up above the front of the hive he could take his knife and reach the piece of paper, and in cold weather draw it down; so that when he packed

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his bees there was a four-inch entrance, and when cold weather settled in such as now he simply drew down that piece of pasteboard and left it one bee space. He claimed that the entrance would never be clogged,—that was with anything like a good colony,—because the cold did not strike in the bottom so much, and when dead bees fell down the bees could go down and clean away the entrance. I tried that, and found it an entire success. Whenever the bees found out that the entrance was not large enough towards spring they would gnaw away the pasteboard as they wanted room.

Mr. McEvoy: That is a matter of locality entirely. Down at Mr Post's that would be too close.

Mr. Post: I am certain it would.

Mr. Holtermann: There comes in the principle of how you fix the top of your hive; you fixed the top so that there is a little moisture; then the moisture does not pass off at the entrance, but up through the packing above.

Mr. Newton: My test with Mr. Alpaugh's plan was just the opposite to Mr. Holtermann's; in our locality, of which Mr. McEvoy speaks, they got clogged up. My friend Mr. Hall was in the same boat. I forget how many he lost the winter before. I was trying it, and he said, "If you take my advice you would go home and pull them all out. When I went home I went to look at them, and I was glad I took his plan to go out to see how they were, because they were all clogged up; then they had some space above—they were not tight above. I would not advise any bee-keeper, from my own personal experience, to try Mr. Alpaugh's plan.

Mr. Gemmell: Was that the time Mr. Hall and I were at your place?

Mr. Newton: Yes.

Mr. Gemmell: What became of the dead bees in there?

Mr. Holtermann: They kept them to one side.

Mr. Sparling: I think the nature of the packing above the bees may have something to do with the amount of entrance. I know the first bees I had, the entrance was very small in the hive. It was only three inches by three-eighths I took Mr. Jones' advice of packing a foot or so of sawdust on top of them, and put some boards on top of the sawdust and stones on the boards. I packed them very heavily all around on top. I think that would have been all right if they had had a generous entrance. I had the fever badly, and the next summer I went and visited all the bee keepers that I knew of around our neighborhood and investigated their method of wintering bees, and tried to find out how my bees had died. I came to the conclusion that they had been packed too much. The next winter I increased the entrance. I still packed them well, but I left off the stones and so on. I made the winter entrance eight inches by three-eighths. I had increased the entrance the full width of the hive for the summer. For a number of winters, winter after winter, I did not lose a colony that I packed outside. The bridge to the entrance I have had from five-eighths to seven-eighths deep and eight inches wide. Of course the entrance to the hive inside is only three-eighths. If I took the trouble to pack them right I found they came out almost perfectly.

Mr. Craig: I have used the same system as our friend Holtermann, but instead of reducing the space I have left the full width entrance of the hive with the bridge to correspond, leaving the entrance of the outer case 4x4. The bees have wintered perfectly during the last two winters in the cases in this condition, doing away with pasteboard altogether. So evidently doctors differ and patients die.

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Mr. NEWTON: I was not saying anything against the cases. I think the cases are all right; it was just the pasteboard. I use the cases.

Mr. MORRISON: A great deal depends upon the climate in which you live. A man along Lake Erie might make his entrance very small in the winter, but I think very few of those in the northern part would care to go and commence picking at the front of our hive to draw a piece of pasteboard down. If we had an entrance ventilation on top the bees would not likely gnaw very much at the pasteboard. I know I want plenty of entrance. I leave a bridge wide at the entrance of the hive and close it up, as Mr. Miller spoke of, on the outside of the clamp

Mr. HOLTERMANN: That matter of entrance and top packing are so related that I would like to say another word about top packing. I do not believe that the proper place for the exit of foul air is at the entrance of the hive during winter. I believe we should have the packing so arranged, and not pack tightly, so that the air will go in at the front and go out through the packing at the top. And not alone that, but in order to do that you must not have your cover board absolutely tight; have the air circulating over the packing so that it keeps drying out. If the air is going to go in the entrance and come out again at the entrance, then the bees have got to get up a current to do it.

Mr. ARMSTRONG: I would like to ask Mr. Holtermann how it is that a colony which is packed with the cover right down tight and the packing right on top of the cover will winter just as well as one with the packing on the quilt with the cover removed, and that the conditions are just the same in the spring in one case as the other? I have seen hundreds of them winter in that way. I do not make any particular difference at all as to where the cover is now, whether down on the brood frames or on top of the packing; I put it just where it will accommodate me If there is room enough above the hive I leave the cover on the top, and the size of the entrance is always three-eighths by five inches. I have had that for this last fifteen years, and I am on the shores of Lake Erie.

Mr. DICKENSON: There is so much difference of opinion among those outside gentlemen that I do not believe I will adopt outside wintering. I advise them to winter in the cellar.

EXPERIMENTS TO TEST WHETHER BEES INJURED SOUND FRUIT.

BY JOHN FIXTER, C. E. F., OTTAWA.

During the summer of 1901 an experiment was started, when there was no surplus honey to be gathered from plants outside, with ripe fruit of four different kinds. Peaches, plums, pears, and grapes were exposed in different places near the experimental farm apiary where it was easily accessible to the bees. This experiment has been continued during the season of 1902, with the addition of strawberries and raspberries. All the fruit was placed in the same position as in the experiment in 1901.

On July 2nd, 1902, ripe fruit of four sorts of strawberries was tried in each place, the Williams, Clyde, Buback, and Warfield were exposed in different places where it was easily accessible to the bees *a*) Inside the bee hive; (*b*) On branches of trees in the apiary inclosure; (*c*) On shelves in a workshop to which bees had access through an open window. Every care was taken that all the fruit used in this experiment should be perfectly sound.

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(*a*) Fruit exposed inside bee hives. The fruit was exposed in three different conditions: (1) Whole fruit without any treatment in the brood chamber. (2) Whole fruit that had been dipped in honey in one-half of the super. (3) Whole sound specimens in the other half of the super. Four colonies were selected for this experiment, all of about equal strength. Each of these colonies was in a hive upon which was placed a super divided in the middle by a partition. In each one of the four hives, the whole specimens of fruit not dipped in honey were placed within three empty frames, tied together as a rack, in the brood chamber; the whole specimens of fruit dipped in honey were placed in one compartment of the super, and the whole sound specimens were placed in the other. The bees began to work at once upon the dipped fruit, and kept continually on it as long as any honey could be obtained. They also clustered thickly on the whole sound fruit, but did not appear to be getting or even trying to secure any substance from the berries.

The fruit exposed on the shelves in a workshop, the bees did not visit at all, nor that on branches of the trees in the apiary. In the two latter places the fruit dried up and moulded. In the hives all fruit decayed more quickly from the extra heat from the bees. This experiment was tried but one week.

July 29—Experiment with four varieties of raspberries: The red, purple, very light colored, and the black cap. Each box contained some of each sort. They were placed in the hives in exactly the same position as the strawberries.

At this date there was considerable honey coming in. The bees did not touch any of the fruit in the hive, super on the trees, nor in the house apiary. On July 31st half of each sort of berries that were sound were cut in halves, to see if the bees would attack the fruit, but they did not touch any of them. All the sorts in the hives decayed much sooner than the fruit exposed. The fruit exposed to the air dried up considerably and moulded.

A second test has been made with peaches, pears, plums, and grapes. They were arranged the same as in 1901. The bees began to work at once, both upon the dipped and punctured fruit. The former was cleaned thoroughly of honey during the first night; upon the punctured fruit the bees clustered thickly, sucking the juice through the punctures as long as they could obtain any liquid. At the end of six days all the fruit was carefully examined. The sound fruit was still uninjured in any way. The dipped fruit was in a like condition, quite sound, but every vestige of honey had disappeared. The punctured fruit was badly mutilated and worthless; beneath each puncture was a cavity, and in many instances decay had set in. The experiment was continued the following week, the undipped sound fruit being left in the brood chamber; the dipped fruit was given a new coating of honey and replaced in the super, and a fresh supply of punctured fruit was substituted for that which had been destroyed. At the end of the second week the fruit that was sound at the end of the first week that had been dipped in honey and also in the brood chamber as well as the punctured fruit, was considerably decayed, and where any openings appeared showed signs of being worked on, but to no very great extent. For the third week, fresh samples of fruit of all the above kinds were used. The results of this test was very similar to that of the first week, and being later in the season the fruit that had been put in sound some of it had began to decay. After the third week the bees belonging to the two hives which had been deprived of all their honey appeared to be very sluggish, and there were many dead bees about the hives; the weather being cool and damp was very much against those colonies. These colonies had lived for the first three weeks on the punctured fruit, and on the honey off the fruit which had been dipped. As there were at that season few plants in flower from which they could gather nectar, these bees had died of starvation notwithstanding the proximity of the ripe, juicy

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fruit. This supply of food which they were urgently in need of was only separated from them by the thin skin of the fruit, which, however, this evidence seems to prove they could not puncture as they did not do so.

The mean weight of each of those two hives on September 5, when the experiment was begun, was 24¼ pounds. At the end of the experiment, four weeks later, each had lost 3¼ pounds. The mean weight of the two hives, in each of which were left five frames with brood and honey, was at the beginning of the experiment 36¾ pounds. The mean loss for each of these hives was 1¾ pounds.

(*b*) Fruit exposed in the open air, hung from the branches of a tree in the apiary enclosure. In this experiment three sets of whole fruit were used, one being dipped in honey, one left sound and whole, and the other punctured as before. The bees worked on the dipped and punctured fruit, but was not seen working on the whole sound fruit.

(*c*) Fruit exposed on shelves in a workshop adjoining the honey-house. This, like the preceding experiment, consisted of dipped fruit, punctured fruit, and whole sound fruit. In this test the bees appeared to work as freely as in the super on the dipped and punctured fruit, and an occasional bee was noticed looking for an opening on the whole sound fruit but did not succeed in finding one.

Experiments with brood foundation of different sizes have also been continued, and one with full-drawn combs.

(1) Full-drawn combs. (2) Full-sheets foundation. (3) Half-sheets. (4) Starters or about 1-inch strips. For this experiment four swarms were caught July 2, weighing 5¾ pounds each. Each hive was weighed daily to ascertain the gain or loss; also notes were taken on how the bees built up the brood chamber. Results are very similar to 1901. Strips of foundation gave the largest return. In this instance the bees started to work, not in the frames, but in the sections in the super, which had full sheets of foundation, sooner than in 1, 2, and 3. Queen-excluders were put on to prevent the queen going up into the supers. In the hives that had half-sheets, also full sheets, the bees appeared to work about equal in the brood chamber and in the super. In the hive that had full-drawn combs the queen began to lay at once, and built up the brood chamber first. The hives that had half-sheets, and also the hives that had starters in the brood chamber, were very unevenly built. The bees built worker combs as far as the foundation, and below that they were built very unevenly, and in many instances they could not be lifted out without being broken, and some of these combs were more than half drone cells. They could not be used for extracting frames, as, not being used, they were too weak to stand the extractor, or in other cases they would be too weak to stand heavy swarms or shifting without breaking down.

From the results of these experiments, it is better in all cases to use full sheets of foundation, both in sections in the supers and in the frames of the brood chamber. I would advise when hiving a brood as far as possible to use full-drawn comb, and if only a limited supply of combs are on hand, use them with alternate sheets of foundation.

Mr. McEvoy: I think we have a gentleman here, Mr. Smart, who might endorse that; I think he is one of the most extensive strawberry growers in the Province; I think he has eleven acres. He is also a bee-keeper.

Mr. Smart: I might say we never had any trouble with the bees injuring our fruit only in the way that the gentleman speaks of—over-ripe fruit. I have noticed the bees on raspberries that have got over-ripe and fallen on the ground.

Mr. Fixter: There was a point I did not mention. They were noticed on the berries after the pickers had picked them, but they did not go near them on the bushes.

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Mr. McEvoy: I can endorse every word. I have four acres of strawberries, and it is the juicy, over-ripe, skin-broken berries that they touch, and they are not fit and should never be put in the baskets.

Mr. Smart: I might say that two years ago this summer one of our neighbors who lives a short distance from us complained very much about our bees during the raspberry season, that he could not work amongst his raspberries, but we were picking raspberries at the same time—we had six acres of them—and while he complained about the bees on his raspberries they never bothered our pickers at all.

Mr. Byer: Were they different varieties?

Mr. Smart: I think not; they were the Cuthberts.

Mr. Holtermann: I would like to ask Mr. Fixter whether there was any record kept or taken of what variety of bee it was, or the age of the queens, or anything of that kind?

Mr. Fixter: There was no record kept of the queen; there was a daily record kept of the weight of the hive.

Mr. Holtermann: Because hiving on starters or full sheets and so on would certainly, I think, be of a good deal of importance.

Mr. Fixter: There was no record kept of the queen.

The President: By using alternate sheets of foundation and full drawn comb, I find the effect has been that the full drawn combs are widened and the sheets of foundation are not drawn out to the full extent; if left to be capped over they are to narrow, not deep enough.

Mr. Holtermann: As far as using the sheet foundation between drawn comb is concerned, I think the majority of us find that our experience exactly agrees with that of the President, that that is a thing that is not at all desirable. If you put a sheet of foundation between drawn comb the result will be, as the President says, the drawing out of the comb and not very much done to the sheet foundation.

Mr. Sibbald: How would you put it in?

Mr. Holtermann: The right way to do it is to put a thin separator between the drawn comb and your foundation until the foundation is drawn out.

Mr. Heise: Would that be necessary in the brood chamber if the proper spacing were maintained?

Mr. Holtermann: I do not know that you can draw out foundation between drawn comb properly; I would sooner put the foundation together and the drawn comb together than to do that.

Mr. Dickenson: I would not recommend using a separater.

Mr. Holtermann: I know an exceeding good bee-keeper who does do that, Mr. S. T. Pettit; that is what he practiced.

Mr. Dickenson: There is no short cut about that.

Mr. M. Pettit: As the son of Mr. S. T. Pettit, I would like to defend that method a little bit I have practiced that, and I propose practicing it a great deal more than I have, not in the brood chamber, but in the super for getting foundation drawn, and I find that one of the best ways of getting foundation drawn. For one thing you have it built down to the bottom bar as you are not apt to get in the brood chamber.

Mr. Lott: I found it worked very nicely to start bees upon foundation between full drawn combs; just as soon as they start to draw it out then shift your combs to the outside and put your foundation in the centre, and you have evenly filled up combs. I know the difficulty there is with uncapped combs drawn out or filled with honey between full drawn combs.

The President: That difficulty would not occur where they are in the brood chamber and other combs were filled with brood.

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Mr. McEvoy: The question was about what difference there would be in the quantities of honey from tests made, and by that means you would find out whether the foundation was worth more than the combs or the combs more than the foundation. I suppose Mr. Fixter is not through with the experiments yet.

Mr. Fixter: That is the reason I did not give the figures. We are very glad to have any member of the Association propose any experiments, and we will try and carry them out as far as we are able. We had started the experiment before Mr. McEvoy mentioned it to me, but he brought it to us on different lines. One of the best points that can be brought out is to find out how much more honey can be got from full-drawn comb or full sheets or half sheets or starters—which is the most profitable. I think that was the object.

Mr. Heise: I think Mr. Fixter rather advised hiving swarms on full drawn combs. Do you not find that very often the queen will deposit eggs perhaps in three or four combs, and in the course of a week or ten days will swarm again.

Mr. Fixter: When I hive a swarm on full-drawn combs I always put the super on at once. My object in hiving on full-drawn combs is to get them so that they do not break the combs down. If you wire and wire well, they cannot break the foundation down. Our advice is more to the ignorant than experienced men, when we advise full-drawn combs if you have them, and if you have not then sheet foundation well wired.

The President: I hived about thirty hives on full drawn combs well filled, and I never had a case where they swarmed out.

Mr. Holtermann: I certainly think there is a good deal of danger of the earlier casting of the swarm if you hive on full sheets.

The President: I do not know what the danger is, but I know as a matter of fact my bees do not do it.

Mr. Holtermann: Do you get a basswood flow?

The President: We do not get much of that.

Mr. Sibbald: I think it is wasting comb to hive swarms on them, I would rather have them for top stories. Hiving on full sheets I consider about half as bad, and I think to hive on starters is just right. Mr. Fixter says he wants to put the top story on right away, so that the queen would not lay in too many combs below. Is that the idea?

Mr. Fixter: So that the bees will go to work in the upper story.

Mr. Sibbald: He does not want them to use the comb he has given them. What is the use of wasting a set of combs down there. You might just as well have a few starters or foundation, and have those combs for the top story. It is for extracted honey I am speaking of. Combs are very valuable, and I want all I can get for top stories. One reason for that is that if the queen lays in those combs that are already for her they have a great big family to take care of, and when they raise them they are no use. There is a loss of economy there. In the starters they have not got the brood nest, and the queen cannot lay. She is put on a very small set of combs, as it were, and the bees go on up into the supers and store the honey and the work goes along nicely, and we get a good honey crop and we do not have a lot of bees to hatch out the last week of the honey flow—that is for the white honey flow; where a person had a buckwheat flow it might be different.

Mr. McEvoy: If you are living in a locality where there is no buckwheat one would be in pretty poor shape for winter in comparison with the swarm that has a good full comb.

Mr. Chrysler: You hiving a colony on full comb and you have a few days of wet weather, the bees can not work, and at the end of that time they get out and gather honey, and if it is for comb honey they will store the honey at first

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down below and probably you will find them swarming instead of going up above.

The PRESIDENT: The trouble I find if I put starters in and put on supers for extracted honey is that the bees will put all the honey up stairs and the hives are in no shape for winter.

Mr. NEWTON: If we have it up on top we will willingly give them some back; it is in the top we want it.

Mr. SIBBALD: In answer to that question, the great thing now is to keep down increase, and I would ask you where you put your old brood nest?

The PRESIDENT: That is left in the other hive.

Mr. SIBBALD: It is left beside that hive, and as soon as the season is over it is put back on; you take those little starters and you can melt them into wax, and then you have only got one colony and it is in splendid condition.

Mr. FIXTER: I think that is wrong. One of the greatest curses we have got to contend with is people selling honey taken out of combs where brood has been reared. It is the greatest detriment to our honey market today, and you do not have to go near the wagon on the markets to see whether it is honey. You can smell any comb where there has been a brood raised in it for two or five years. It is taken out and given to people, and they are sickened, they want no more honey evermore afterwards. Just as sure as you use that plan it is liable to create a bad taste.

Mr. SIBBALD: I do not understand Mr. Fixter when he says that that is for extracted honey. It has not been bred in five years, it has only been hived on and perhaps bred in one year.

Mr. FIXTER: A man who has half a dozen hives takes a knife and runs around it and puts it into a tin dish and sells it.

Mr. HOLTERMANN: That is in Ottawa.

Mr. FIXTER: It is not only in Ottawa, for only last week I saw it was done in Brantford.

Mr. DICKENSON: I do not think every man in this room is working to keep down increase. I should think Mr. Sibbald would advocate a method that would be suitable for all parties.

Mr. BYER: I might say I was out to Mr. Sibbald's this fall, and he explained his system pretty thoroughly to me; in my opinion it is all right. His system necessitates an awful lot of work; it means practically going through every brood chamber in the fall without exception. He contracts largely for wintering. I suppose it is not really a trouble. I do not think he contends he does not get a great deal of drone comb, for if I remember rightly he admitted he got considerable. As far as I am concerned I would not think of going through every brood chamber in the fall; it is too much work. There is a great deal in the size of the frame; and to talk of using starters and all that; it is out of the question.

Mr. PETTIT: I would agree with what Mr. Sibbald has said in every respect, and I would explain a point that I think he did not fully explain—that is about contracting the brood chamber. How many of those starters do you give?

Mr. SIBBALD: I give the full hive.

Mr. PETTIT: That is where we differ then. I would not give more than six Langstroth frames. If you give just about that number you get quite a large percentage of worker combs—very fair ones.

Mr. HEISE: Running for extracted or comb honey?

Mr. PETTIT: Either.

Mr. NEWTON: I agree with Mr. Pettit.

Mr. MCEVOY: The objection to this starter business is drone combs. I do not think I own four inches of drone comb in all my apiary, and I have practi-

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cally shut them out; but they will work them in on the edge somewhere. I have had them convert a little irregular sized worker comb to drone. I have shut them out wherever I could.

Mr. MORRISON: If Mr. Sibbald is telling us what he does now, he has got all the bees he can handle, but it is certain enough that is not the system he tried until he got that quantity of bees. When he had only ten or twelve or twenty colonies he did not practice trying to keep down increase.

Mr PETTIT: I am working for increase to a certain extent now, and I practice hiving on starters just the same. All the extra worker combs I want to get built in the super: I think I can get that done better in the super than in the brood chamber. The peculiar point in getting it down there is that you get it built down to the bottom bar; you do not have that space.

Mr. MCEVOY: Do you put on all foundation or part comb.

Mr. PETTIT: About half comb and half foundation. I put the comb in the middle and the foundation at the outside and two separators in each super.

Mr. SPARLING: Perhaps I might suggest a compromise between your combs and Mr. Pettit's system of starters. I would not use eight frames if I were hiving on starters; I would only use five or six at the outside, more often five, if I wanted to practice economy. About three weeks after I had hived them I would fill it out with some of those old combs of yours, and then there would be a chance of it being a fair colony for the fall.

Mr. SIBBALD: I do not have any more swarming than I can help, and I do not calculate to have more than thirty per cent., anyway. I increase by nuclei, and in the case of an old colony set off there it is a very easy matter to divide that old brood nest and put only half of it back. The other half is left with the young queen if you want to increase; if you do not want to, you can put it all back. Colonies that do not swarm are left untouched, or you can form a nucleus of one or two combs out of them if you want to. I think that is Mr. Post's system of increasing. When you hive on starters, say ten, and the bees cluster right along on them, that is contraction, but they have got any amount of room, they are not apt to abscond or swarm out of it. I often take an empty super and put under one with the starters on.

Mr. PETTIT: In two or three days take an empty hive, and take out the starters at the outside that they have not started to work on, and put in dummies; then the ones they have started to work on they build with worker comb down to the bottom very well.

Mr. SIBBALD: It is very seldom they ever work down any more than four or five of the empty ones which are better than a dummy, because you do not want them too close.

Mr. PETTIT: How about worker comb?

Mr. SIBBALD: I am not particular about that, to tell you the truth, because I do not use them to winter on at all.

Mr. PETTIT: If you do not care about worker combs I would leave the dummies out.

Mr. SIBBALD: I take those combs out in every case, and if they are nicely built and started well I use them in the top stories. They have only had one set of brood in, and they are good and tough for extracting combs.

The PRESIDENT: I do not think using old comb for extracting is so bad as Mr. Fixter says.

Mr. FIXTER: As long as there is no brood raised in the combs I would have no objection, but I compare a comb where brood has been raised to an egg out of which a chicken has been hatched.

Mr. HOLTERMANN: I think Mr Fixter is the only man who could walk along the market and tell whether the honey had been taken out of old combs or not.

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Mr. MILLER: If Mr. Fixter will take his old comb, and with a watering pot will fill the cells with water and let them stand for a time, and then reverse them and throw the water out, he will be surprised at the color that will come out of them; then after that his honey is clean. There is no necessity for destroying the old combs.

Mr. DICKENSON: I tested that. I was prejudiced against those old combs, I had an idea they affected the color of the honey, but I was really surprised in testing the honey that came out of the dark comb and the honey that came out of the drawn foundation. Really it was just as light as the light combs; that is after it has been cleaned up.

THE PRODUCTION AND MARKETING OF EXTRACTED HONEY.

BY J. K. DARLING, ALMONTE.

The subject assigned to me by the Committee is not one which I would have chosen, and as so much has been said in the past, and that by men of wider experience and a more thorough knowledge of the business, it might not be amiss for me to touch on some points which might raise a discussion, and in that way be of more service than would a lengthy essay, no matter how well put together.

First, the Production. It is conceded we must have the bees to start with; then, we must have the man, and as neither can produce extracted honey without the other, I would say the man is of far more importance than the bees. A first-class man will do far more with an apiary of inferior bees than could a useless man with the same number of colonies of the best strain of bees; but both together cannot produce honey if there is no nectar to be gathered, as many of us have found to our disappointment.

Granted all these conditions are favorable, what then? First, we should aim to produce an article which will sell itself, if possible to do so. Second, produce as much of it as possible; quality first, quantity second, every time. What is "Quality?" Flavor first always, then body and color, or color and body as circumstances require; this for the home market. For shipping purposes, I would put color first in quality, flavor second, and body third. Why the difference? For shipping purposes honey must be attractive, and catch the eye, as there is a pretty general idea abroad that lightness in color is a sure indication of superior quality, and we must please the eye. Now, if we can combine the richest flavor and firmest body with the lightest color, almost or quite water white, if you wish, we will have the ideal honey. In actual practice, how many get that? You who have been selling honey of different shades direct to consumers, may answer that question. Why should not a honey which is a rich straw color, or an amber color, but fine flavor, stand ahead of a water white, which is lacking in flavor? Question: How can we secure the highest flavor with the lightest colored honey every time? Localities differ. Seasons differ in the same locality, and so does the flora differ in the same locality. Pure clover honey differs in shade in the same locality in different years; and so does it differ in different localities in the same year. Why is this? How should such honey be graded? I would say flavor should stand first. Allowing honey to be well ripened in the hive gives a finer, firmer body, does it also give a richer flavor? I think it does. With the particular method of handling combs, of wielding the honey knife, and of turning the extractor, I shall not meddle. Let those who have taken their tons every few days deal with that.

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Second, the Marketing. This is a matter needing our most careful attention. If it is the home market, just show some of that first-class honey to the would-be consumer, and it is sold; at least as much of it as they need for the present. A word of caution here: Do not sell too much honey to one house at one time. Let them clean their dishes every few weeks. A jar of granulated honey on the top shelf of the pantry is not likely to help sell a very fine liquid article which comes to the door. Better let them want honey for a few days. Supply a good article at a fair price, and you are tolerably sure of your customers, unless you keep them waiting too long.

Is the honey to be shipped and sold to strangers. Well, I give it up. There are commission men, good men and true; at least some of them. Perhaps they do not know much about handling honey. Then there are men who are wanting to buy all the honey in sight, but are not prepared to pay much, there has been such an enormous crop! Are they any help in marketing our honey? Then there are some who might purchase a quantity wholesale, and pay a fair price; but who will bring the producer and the dealer together? What about that Honey Exchange?

The PRESIDENT: There is one point, and that is as to the quantity you sell to the consumer. I do not like to sell a small quantity to a consumer. If you sell a man a pound or two of honey, he comes to the conclusion that it is a luxury, but if you can sell him ten or twenty pounds, after his family get the feather edge off their appetites, they think it is not so very expensive, and they buy more.

Mr. McEVOY: I do not care how much a dealer buys, but my experience is when a customer gets fifty or sixty pounds he gets sick of it, and I could not sell him a second time.

Mr. DARLING: I endeavor to supply a man with ten or fifteen pounds, but where they ask for twenty-five pounds, I do not think it is to my interest to give them all of it at one time.

Mr. DICKENSON: I cannot understand how we are to act when a man insists on having fifty pounds.

The PRESIDENT: Give him all he wants.

Mr. McEVOY: I am speaking of where they never had much, and ordered fifty or sixty pounds.

Mr. BROWN: This leads me away back to a few years ago. When I selected a customer I went to him, and took a pound bottle with a sample of honey in it, to show to him. He examined it and said, "We have got lots of honey just as good as that, which we bought for six cents a pound," and I was asking seven or eight cents by the hundred. I said I would like to see some of this honey. He went after it, and he brought a ten-pound tin, and he worked for a while before he got the cap off, and it just flew out, something like ginger ale. He said, "Take that away, I do not want to have anything more to do with it." He picked up my pound bottle that I had for a sample, and said, "How much of that can you spare?" "Well," I said, "I can spare a considerable quantity." He says, "Can you let me have fifteen hundred pounds?" I said, "No, I cannot, but I will let you have a thousand pounds." After we had settled on a price he said bring it on. He was a private individual. I brought him the thousand pounds of honey, and that was the last pound of honey I ever sold that man, because he got too much of it.

Mr. HOLTERMANN: It seems to me it depends a great deal upon who you are selling to. For instance here are a lot of men who have been using honey for years, and they know all about it, and they know just as well as you do what they want, and it is perfectly safe to sell to a man like this what he wants. On the other hand there are others who perhaps get a taste of it and they want to

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buy a lot of it, and perhaps without a good deal of explanation it is not advisable to sell to them. One of the difficulties in connection with this matter is granulation. When you sell a man honey in a can with a small screw cap he cannot get at that when it becomes granulated and he does not know how to liquefy it. If you sell to that man and say to him, you put that jar of honey into jem jars when you get home, keep it sealed up and in a dry and warm place, and then after the honey is granulated eat it that way, that is all right. But in the other case the result is he very often leaves it standing. I believe in advocating more and more to eat the honey granulated.

Mr. SPARLING : Everyone does not prefer it that way.

Mr. HOLTERMANN : Everyone does not, but a great many do.

Mr. SPARLING : Bee-keepers who have it in hand from year to year know pretty well. They eat it both ways.

Mr. HOLTERMANN : I do not believe there is a better way of selling honey than to sell it in granulated form, because you take that honey and put it into a barrel and you sell that to a grocer; the grocer puts that barrel of granulated honey in the window and it attracts the whole town, and you can sell that honey without the cost of a package every time because that can be put up the same way as lard. One of the great disadvantages we have to-day is that the man has to pay for the package every time he buys honey. I know one store, not a very large store, that sold after Christmas three barrels in that way, and this fall that same party ordered five barrels for a start, as he called it, in that way, and he told me that people came to his store to buy that honey that had not been in that store since the last honey was bought. It tastes nice and you get away from the expense of the package.

Mr. GEMMELL : How was the honey sold ?

Mr. HOLTERMANN : Just like cutting cheese; took a wire and cut a piece off around it and then cut it down.

Mr. MORRISON: Do I understand you that he stripped the barrel off the honey?

Mr. HOLTERMANN : Yes. I wrote an article for the *Canadian Grocer* upon that very subject, and had a photograph there as to the way to sell it. I know men twenty miles out of Hamilton, that did not know I had anything to do with it, who told me of the remarkable sight in the window. If you can get people to talk up your business in that way it helps a very great deal.

Mr. BROWN : I think in my humble opinion with regard to taking the barrel off and cutting up the honey, it would be rather strange if he did not get flies and other things mixed up with it. You want honey to please the eye as well as the taste.

Mr. MORRISON : What kind of barrel did you use ?

Mr. HOLTERMANN : There is the glucose barrel; you can get them for 50 or 75 cents and they will run 700 lbs.

Mr. MORRISON : Do you line with paraffine ?

Mr. HOLTERMANN : Better to do it. A pound of paraffine will do that work. To get your barrel in the window take the hoops off with the exception of one or two, and when you get it in the window take the rest of it off and it stands. We have not got many flies or much dust in Brantford at this time of the year. That man I refer to is selling it right along at 12½ cents a pound.

Mr. DICKENSON : I agree with friend Holtermann that honey in the candied state is about the right condition. I find in our family there is good honey in both grades, the clear and granulated, and the granulated is taken nine times out of ten. I myself would like to hear an expression of opinion. I prefer it.

Mr. BROWN : I think if you go into a grocery store and there is a range of both kinds of honey, I think nine times out of ten the grocer will sell the liquid honey in the glasses.

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Mr. SIBBALD: I take issue with Mr. Holtermann on this question. To show you that people prefer the liquid honey, we have frequently jars of granulated honey sent back to us and they say, we cannot sell this, will you not change it, and give us the liquid honey. As soon as it granulates on the shelves it seems to stay there; nobody will buy it. Referring to the paper, there is nothing more important than the quality of the honey. You would be surprised, if you would handle a lot of honey, to find how many bee keepers produce a poor quality of honey, and how hard it is to pick out real nice thick honey. Now the production and sale of such honey is going to hurt the honey market more than anything else.

Mr. MCEVOY: Mr. Sibbald's experience and mine is exactly alike. I have sold 60 tons in little glasses and everywhere in the grocery stores. Nothing is more important than the question of quality.

Mr. NEWTON: I fully agree with Messrs McEvoy and Sibbald. People prefer the liquid to the granulated. Last year at Buffalo when the people came in and looked at the granulated and the clear, they preferred the clear. We have got to please the eye, and when we do that I think we go a long way to please in other respects.

Mr. HOLTERMANN: We can do a great deal in educating the public. I do not propose every one shall have a 600-pound barrel of granulated honey; at the same time I believe if sold in that form a man can sell more of it than he can in any other way.

Mr. HOLMES: The general trend and drift now-a days is to put up all goods in small parcels in the stores; we find dried fruits and other commodities are put up in small packages, and even some lines of sugar are put up in fancy packages.

Mr. BYER: I think we might talk on this question as long as we like, and honey will continue to be sold in both ways. We must use our judgment. I believe every bee keeper agrees that in selling anything in a glass it must be kept in liquid form. Our home trade is all sold in five and ten-pound cans, and the directions are put on the labels how to liquefy when it has granulated. I believe nine tenths of our customers prefer to use it in the liquid form.

Mr. HEISE: The practice of supplying a customer with a limited amount when he requires more seems to me to be contrary to all the best principles of trade.

Mr. MILLER: I think it is generally conceded that it is to the interest of the bee keeper to put out a nice grade of extracted honey in candied form if he can get the consumer to use as much of it. It has been said it is a matter of education. If so, bee-keepers are the one who must do the educating. I have been educating my trade to the granulated honey, and I put it up in five-pound bottles, slip cover, and I find no difficulty with my trade in placing it in that way. With the candied form there is no drip, it goes out in nicer form and the customer understands liquefying now.

Mr. COUSE: I suppose when a customer comes along that a man likes, he wishes to supply that customer with exactly what he likes and wants; he likes to give it to him in as good condition as possible. I have in mind a customer whom I persuaded that I could do the liquefying far better than he could himself; and he always has something to suit his taste; he can have it liquid or granulated, in the glass or can. Try and arrange to suit your customers, and I think in that way you can stay with them.

Mr. WHITESIDE: In producing honey I think we ought to have a little care for the poor, and we ought to get it into their hands as cheaply and conveniently as possible. I agree with Mr. Holtermann on the question of having the honey in cake form.

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Mr. MORRISON: It is a great deal owing to the taste that has been cultivated whether people demand liquid or granulated honey. I do not agree with Mr. Holtermann as to rolling a six hundred pound barrel of honey into the window. I think if you did that in Barrie, it would be a long time before it would be disposed of. On the other hand I admire the cheapness of it. I have thought for years if we could get a small tin package, such as is used for tomatoes and apples, something that the grocers can put on shelves, it would be less trouble to us.

PROF. SHUTT: There are some figures in the remarks I have to make this afternoon which will throw some light on this question of marketing honey, particularly with reference to the scheme that Mr. Holtermann has brought before the meeting. We have ascertained, as probably many of you know, that honey is a very absorbtive material if placed in a moist atmosphere; it will increase in weight by absorption of water to a tremendous extent, and I fear some of you, or the grocer, might get into trouble or difficulty if granulated honey were exposed without any containing vessel. When I took this matter of granulation up first it seemed to me there was a popular impression that granulated honey was adulterated, and I dare say a little of that old impression still exists and is prejudicial to the sale of granulated honey.

Mr. HOLTERMANN: What Prof. Shutt says is perfectly correct, but when you take the winter season and you put in a window an article of that kind with comparatively little of the surface exposed there is not any great danger.

QUESTION DRAWER.

Q: Tell us how to clip queens' wings?

Mr. MILLER: My method is to set the comb on end, following with my thumb and finger, allowing her to run between; just drop it over her shoulder, and in that position clip her whilst she is on the comb.

Mr. BROWN: What do you usually clip her with?

Mr. MILLER: I have always used scissors.

Q.: How to get the most honey with the least labor, and in the shortest time out of beekeeping?

Mr. MILLER: I think if a man goes in to beekeeping he must place out-yards, and detail a system of close management, so that he can handle those yards with very little skilled labor outside of his own. It has an advantage of specialty, and I think beekeeping should be put on that footing.

Q: Should not some protection be given? Do queens use queen cells more than once? Should they be broken up?

Mr. MILLER: I used to give spring protection. Queen cells, I think all understand, are never used but once, and if they are not broken up the bees will cut them out or leave stubs; they will reduce them, never using them but once.

Mr. FIXTER: Would it not be a very great advantage to locate our apiaries where there is shelter and protection from the cold winds, and then close the entrance blocks considerably.

Mr. MILLER: I certainly think so, if possible. I think they should be looked after in that way. If we can get a sheltered spot the yard will receive great protection from the cold winds, and also reducing the entrance to the requirements of each colony.

Q: Is Prof. Harrison's method of formalining combs practicable, or must we destroy infected combs?

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Mr. MILLER: I have had no experience with that. Prof. Harrison has given us a great deal on that. I think he stated at our last meeting that combs could be saved.

Q: What is the best clover to sow for honey, useful for farmers and fodder?

Mr. MILLER: I would say alsike.

Q: What is the best time for re-queening?

Mr. MILLER: That I think would largely depend on a man's time. I have always found a very good time just after the honey flow, after extracting and the work of the yard was all in hand, to re-queen; say through August.

Mr. FIXTER: As to that previous question. Mr. Miller recommends alsike. I think there is a better than that; I think you can get more honey from alfalfa, and then there is sanfoine. I think if grown extensively we can get more honey and feed more bees on alfalfa and sanfoine than even white clover. I think it would pay any beekeeper to try it on a small scale and see if it will grow in his locality, and if it will grow at all I am sure it will be a boon to beekeepers.

Mr. LOTT: Will sanfoine stand this climate? We have tried it in our locality, and it usually winter-kills the second winter.

Mr. FIXTER: It stands it in our locality.

Mr. LOTT: Do you not find also that alfalfa is cut before any nectar secretes in it?

Mr. FIXTER: That is the beauty of sanfoine. Leaving the question of honey and fodder out of the question altogether, as a fertilizer we believe there is a very great benefit from that line.

Mr. HOLTERMANN: I will not believe there is any clover equal to alsike. Around Brantford we have had fields of alfalfa, and the bees passed right over its bloom and went to the alsike fields. Where there is irrigation and an abundance of moisture there may be something in it.

Mr. CHRYSLER: We have a good deal of alfalfa in our district, and have yet to find a bee on an alfalfa blossom.

Mr. FIXTER: The great advantage of sanfoin is that the bees cluster on a second cutting just as readily as they will the first.

Mr. MILLER: My experience with alfalfa has been very much as stated by Mr. Holtermann.

Mr. McEVOY: If you get the honey from it pure, how do you like the quality?

Mr. MILLER: I never have had it.

Mr. HOLTERMANN: I have tasted it on the other side; I think it is beautiful honey.

Q.: What is the best time to take bees out of clamps? In the spring or just before clover bloom?

Mr. MILLER: I have always practiced taking them out as early in the spring as I thought advisable, according to the strength of the colony and condition of the weather. I am always anxious to get them out as early as possible on account of clipping the queens; and yet do not wish to place them out before the colonies are strong, and not retard the brood rearing; usually just before apple bloom.

Q.: For extracted honey is it advisable to have an extractor and other tools at each apiary, or carry them around on a conveyance, and also strain and put in cans the honey and bring them home as the honey is extracted?

Mr. MILLER: My system has been to have a full outfit at each yard, and not have more to take from one yard to the other than possible. I also strain and put into the package and draw that home as early as possible.

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Q. : Do you consider 2,000 cubic inches sufficient space for a brood chamber when it is desired to suppress swarming ?

Mr MILLER : That is something I cannot explain. I think plenty of room retards swarming, but it will not prevent it.

Mr. MCEVOY : No ; it can be made large enough by removing the brood ; and, taking one thing with another, that is my choice. 2,000 cubic inches is enough.

Mr. HOLTERMANN : This question of the size of the hive is one which has been before the bee-keeper for a good many years. It is not a new matter at all. The Dadants, I believe, have been using large hives for fifteen or twenty years, and there is nothing original on the part of those who are using large hives now; they are only following some one else I believe when we get a poor bee keeper who cannot get his hive well filled with brood early in the season he had better have a small hive ; but if you come to one who will look after his business and whose business is bee keeping during the beekeeping season, he will have no difficulty in getting an eleven or twelve framed hive filled. There is no use though having a few bees and trying to put them into a large hive.

Mr. MORRISON : Would Mr. Holtermann use a twelve framed hive if he was in a locality where there was only a clover honey flow, no basswood or buckwheat ?

Mr. HOLTERMANN : I am not in that kind of a locality.

Mr. DICKENSON : Locality is everything.

Mr. MORRISON : Yes, in that case.

Mr. HOLTERMANN : If you only have a clover flow, and a flow of short duration, I believe it is all the more important to keep your bees together. The shorter your flow the less you can afford to let you bees divide up, and by having a large hive you get that.

Mr. POST : Yes, and there is also another advantage ; if you have a large hive you can make a small hive of it. If the bee keeper does not get his bees in good condition in the spring I suppose the small hive is just as good, but if in good condition he could use a large hive to better advantage than the small one. For extracted honey it requires a large hive ; I cannot see where a small hive comes in play at all. You have either got to allow the queens to go in the top stories and lay, or you will have swarming. I am in favor of a large brood nest.

Mr. DICKENSON: Mr. Post is in a different locality. We simply can get no buckwheat honey There is some basswood but it is getting less all the time ; we have to depend now on the clover honey. I prefer the nine-frame Langstroth.

Mr. HEISE: In my locality this year we had practically nothing but a clover flow. While we had a light buckwheat flow there was nothing stored in the supers. The majority of my hives are ten-frame, eleven inches deep the same length as the Langstroth. I have yet a few ten-frame Langstroths, and with an exclusive clover flow my average this year was 133 pounds to the hive. I am bound to say that those in the Langstroth ten-framed hives put up the most honey in every instance. Another peculiar thing is the idea that was brought out that with the larger hive swarming could be controlled more successfully. This year and a year ago in my yard while I only had six colonies in Langstroth hives, those were the ones that did not swarm with the exception of one or two, while the others invariably swarmed. There may be other conditions that have brought that about.

Mr. FIXTER: That is one of the experiments we have been carrying on for a number of years with different sizes of hives, and in our locality we can get more honey out of the Langstroth hives than out of the large ones. We have the eight-framed hive, but I would prefer the nine-framed.

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Mr. POST: That is the size of hive I use.

Mr. HOLTERMANN: How does Mr. Heise account for it? There could not have been as many bees in the ten-framed hive, that is sure. It is impossible, because we know with the same number of bees in the ten frames as the twelve frames, other things being equal, they would get the swarming impulse sooner. The shorter your flow is the less you can afford to let your bees divide up and swarm. It is all in a short time, but if there is more produced in the beginning of the season, I can afford increase if I am going to have a later flow, because those bees can do something. If the flow is only short I am producing bees for practically nothing. It makes no difference what sized hive you use.

Mr. CHRYSLER: I find I can fill a large hive with bees and brood as easily as I can a small one in my locality, where I have a good big flow of fruit bloom honey.

Mr. DICKENSON: I frequently have in my locality a complete failure of the fruit bloom What do you do then?

Mr. McEVOY: I do not believe in a hive over 2,000 cubic inches. You can make it as large as you like by tiering up. Mr. Post is in a buckwheat section, and if I was there perhaps we would have to do the same. With large brood chambers they will store too much honey in them and not enough on the top; they will come out a little short in the surplus.

Mr. POST: Then you would have to feed for winter.

Mr. McEVOY: There again we perhaps winter a little differently. You winter in the cellar. Some person told me it was 25 below zero down at Ottawa; in my locality before I left it was ten above; there is a difference of thirty-five degrees. I winter on summer stands, and if I have to fit up a hive the brood chamber is pretty big. If I had the colony to feed up I would rather feed a smaller hive in good shape than put the same amount in a larger hive and not have it all sealed.

Mr. DICKENSON: To show the difference in locality, my plan is to get as much honey down in the brood nest as possible after the white honey flow is over. Mr. Post will take off two crates of honey; he wants to get the honey up in the supers. I want the honey carried down. If there is any honey that is not fit to extract then the combs will go on.

Q. Would you advise all metal excluders or would you use metal and strips of wood?

Mr. ARMSTRONG: For my part I would use both. Use strips of zinc and strips of wood and put a wooden frame around. They are the best honey board or queen-excluder I ever used, but they are a little harder to make and a little more expensive, so I have come to the all-metal with a strip on the outside.

Q. Do you notice any difference in the results between the two?

Mr. ARMSTRONG: If anything, the all-metal has the advantage as far as my experience goes. There is more openness between the upper and lower part. The metal they are sending out now is perforated so closely that there are small strips between the two perforations, and they are nearly all open, and it is nearly like as though there were no queen excluder between the two at all. When there is just one row of metal between the wooden strips it clogs and fills up more or less; they are harder to keep clean.

Mr. SPARLING: A friend of mine used a strip down the centre of two pieces of board, and I was in his yard, and I could not see but that they did just as well as with the full sheet of metal. He claimed they did, and he had some each way.

Mr. ARMSTRONG: At one time with the Hedden or Jones hive there was a board used that was not a queen-excluder, but with seven-eighth inch wooden strips. I found out the bees would go up quicker through that than they

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would through the metal and wood together, but I did not like them on account of not being queen-excluders.

Mr. McEvoy: I like the all metal with a rim around about five-sixteenths and sprung in with a button, and when you take it off it springs off; it does not clog up, and you can scale them.

The President: When you use them with the metal would it be advisable to have a strip of wood to leave a bee space?

Mr. Armstrong: Oh, yes. And also in the Langstroth frame you want a strip or two small strips across the centre; if you do not have that the metal will sag down and it will spoil the bee space.

Q. Would you recommend a deeper frame than the Langstoth for the brood chamber?

Mr. Armstrong: That is a little out of my line. I am an eight-frame man. Last summer I thought sometimes I would like to have something a little bigger.

Mr. Heise: I might say during the first two years of my bee keeping I used the Langstroth, and I concluded they were too shallow. Then I jumped to a frame about thirteen inches deep, and I got out of the frying pan into the fire. Then I came back to eleven inches, and that just suits me.

Mr. Holtermann: I think the Langstroth is deep enough, and it is so much of a standard frame I would stick to it.

Mr. Chrysler: For extracted honey eleven inches deep is preferable to a Langstroth.

Mr. McEvoy: Do you not think the man makes some difference?

Mr. Armstrong: Yes, every time. I look at it from this standpoint: It is dollars and cents I am generally after, and providing I have got even only fifty hives, is there enough difference and would I gain enough by making the change? I have never seen it in that light yet.

Q. Do you consider it a good plan to return a swarm to a parent hive after a few days?

Mr. Armstrong: I have never tried that; therefore I do not know. I would say "No" myself.

Mr. McEvoy: No.

Mr. Martin: I think in the July number of the *Bee Journal* I saw a piece about that. It said that after two or three days to return to the swarm if you did not require the increase; and I thought I had all the bees I required, and so I adopted that plan, and I found that the bees went right to work the next morning.

Mr. Gemmell: I think that is the Dadant plan. It has been recommended by them. That is, when a swarm issued, to hive that for twenty-four or forty-eight hours, and then return it to the parent colony, and there would be no further swarming. I tried it, but I never found it to work. Locality may have something to do with it.

Mr. Dickenson: I think locality would have something to do with it.

Mr. Darling: I tried it once or twice with prime swarms, and I do not want to try it any more. With second swarms I do not wait two days, or two hours. I go in and run them right back home, and there is no fighting or swarming. If I can manage to get the queen cells torn out of the hive and get the bees back almost before they are settled out of the air they do not come out again. That is all after swarms; I mean all swarms with virgin queens.

Mr. Armstrong: I took from the question that it was prime swarms he was talking about.

Mr. Darling: Well, it is not a success with me.

Mr. Martin: Mine were not prime swarms, most of them were second swarms. When I put them in the hive I put them two or three feet from the

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entrance to the parent hive, then I left them there two or three days, and shook them down on the lighting board the last day in the evening, and I had no swarming.

Mr. ARMSTRONG: Did you not take the queen cells out.

Mr. MARTIN: No.

Mr. ARMSTRONG: And you had no swarm?

Mr. MARTIN. No, only in one case.

Mr. PETTIT: I have found Mr. Martin's plan works all right for second swarms; after two or three days run them back. I could not find time hunting the queen cells, because if I missed one then it would be all undone.

Mr. ARMSTRONG: I would wait three or four days.

Mr. HEISE: Is not a colony, if it is strong enough, liable to throw another swarm?

Mr. PETTIT: It would this year; swarm every day for a week.

Mr. ARMSTRONG: I would just take a hive and open it up, and cut out all the queen cells, and then fetch the swarm back and empty it down at the entrance and run them in. That is the end of it.

Mr. DARLING: I try to make a thorough job of the queen cells.

Q. I wish to hear some advice on cellar winterings?

Mr. WHITESIDE: Is a fly hole quarter of an inch square sufficient in cellar wintering?

Mr. ARMSTRONG: I would say no.

Mr. CHRYSLER: A quarter of a foot is better than a quarter of an inch.

Mr. FIXTER: From what we know of the Ottawa district, I would say winter in the cellar every time as against outside wintering; and I would like to have them on shelves, although they do very well tiered up. We like to give them lots of space below; we find they do not consume nearly so much honey inside as outside. Bees wintered outside do very well in the Hedden and in Root hives where there is not too much disturbance, but I prefer wintering in the cellar if you get a good dry cellar, but not too dry. I might say we are trying an experiment with half a dozen hives in one portion of the cellar, and I have got a couple pails of water to see if the moisture of the water being in the cellar makes any very great difference.

Mr. HOLTERMANN: There is such an immense difference in cellars. Would you advocate a man wintering in a cellar just because he has a cellar? If a man has not a good cellar he had better winter outside in this western part of Ontario.

Mr. FIXTER: It might be in the western part of Ontario, but not in the east.

Mr. DICKENSON: I have wintered in the cellar ever since I have kept bees, and blocked them up with four blocks under each corner and tiered them up real high. As to the cellar, it is a matter of temperature; dampness plays no part at all in the condition of the cellar; if the temperature is right it absorbs all dampness. I run them in conveniently on a little truck; it is very simple, putting 150 colonies in my cellar in four hours. Keep the temperature to about 42 degrees; it varies to about 45 degrees, but the bees are very quiet. I am contented to leave them alone as long as they are quiet.

Mr. BROWN: My experience in wintering bees has been in a cellar for probably 25 years; but for the last ten years I have had a cellar the full size of the house, stone foundation;—that is, 23x25x7 feet deep with an earthen floor. I would consider it better if there was a cemeted floor. I want the bees with a good queen and plenty of stores, say no less than 25 or 30 pounds of honey, to go into the cellar, and as we usually have to put them in from about 10th to the 15th November I want to have the hive dry, not covered over with

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snow, or wet, and I like the bees to have a fly or two a day or so before they are set in. We have a way of carrying them to the cellar door from the bee yard, and we go right in under the house and set them back on the stands. The stands are about 15 inches from the floor, poles with 2x4 scantling and we set them on those, and the bottoms are attached. I leave the entrance the full width open; that entrance is usually $\frac{3}{8}$ths by 7 inches. I remove the wooden cover. The propolis quilt is left on. A strip of scantling an inch square is put on the front end of the hive, and the same right along from one end of the hive to the other. A second tier of hives is set on top of that, and goes right up three or four tiers according to what is necessary. Then if the bottoms are not attached I raise them up, and slip blocks under and give them the full entrance, and with the last tier on top I leave the wooden cover on loosely. I find very little difference between the hives with the bottoms attached and the others that have been raised up when they came out in the spring. My experience has been less than 3 per cent. dead in the spring when we took them out. I think that is about as fair an average for wintering bees in the cellar as could be expected. The usual temperature is from 40 to 45 degrees, and it sometimes runs up to 48 degrees. The ventilator in this cellar is simply an ordinary stove-pipe run down to within about 15 inches of the floor of the cellar, brought up through the floor in the house and attached with an elbow and T into the stove-pipe in the drawing-room. I have had the best success in wintering, in what I call the Galop frame; it is about 11 or 12 inches. I find ten frames of this kind come out every time better than the Langstroth hives.

The PRESIDENT: I winter very much the same as Mr. Brown. Instead of having those stands, I simply put down a hive body, and then tier up each separately so that when you lift the hive either on or off you do not jar the whole lot of them. I stand them four hives high and the stand is simply a surplus story. Instead of taking the trouble to block them all the way around, I simply put two blocks in front; I tip up the hive, and in order to bring it to the proper level again I put a stick under the back end of it and go on that way to the top. I use quilts and leave them without being removed. If the bottoms are nailed fast I turn up the quilts at one corner at the top. I scarcely lose any except by starvation.

Mr. DICKENSON: I suggested four blocks, and my reason is that I have neglected to put any blocks in the back end of the hive in one row, and I noticed particularly there was a dampness at the back part of the hive. Those that had been blocked up I found all dry.

The PRESIDENT: My cellar is probably drier than it is here. I do not care if the snow goes in; in a short time it is perfectly dry. There is a furnace in the adjoining room. In fact, I am a little afraid that the air is too dry. Probably with a damp cellar it would be better to have them blocked up all around.

Mr. HOLTERMANN: I think you could simply accomplish the same thing by having them blocked up at the back and not the front. You have an opening at the front and the air can circulate right through. I think if you have some packing over the bees so as to keep the under surface of the quilt dry, and that is cool, there is a tendency for moisture to condense and perhaps even drip on the bees. What we use is a felt that is used in England; it is $\frac{1}{8}$ of an inch thick. The cushion is clumsy and cumbersome; but the use of a piece of felt which is laid on top of the quilt will prevent any moisture from condensing.

Mr. HOLMES: For a few years I have been practicing the removal of the propolis quilt and the putting on of a clean cotton cloth and a cushion of very dry saw-dust, probably $\frac{1}{2}$ or $\frac{3}{4}$ of an inch thick, and I raise the hive at the back so that each tier is separate and independent of the others. I find them to winter very perfectly in that way.

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Mr. MILLER: When wintering inside I find it very convenient to do away with those blocks you mention by simply leaving off my bottom board and piling one hive across two, first placing a row along on 2 x 4, as Mr. Brown spoke of, about eight inches apart, and then commencing and setting one on top of the first and second one, and so on.

Mr. FIXTER: When we cellar them we leave the bottom board off entirely. We tried Mr. Pettit's plan of raising the hive at the back three inches, and the body of the hive 3/8 of an inch from the bottom board, and so on, and it is a perfect system. It was published in the Journals and in our farm report. We also tried Mr. Hall's plan of raising up the front instead of the back; we found it quite a bit of trouble putting that 3/8 of an inch piece in at the back; it disturbed them more or less I do not think you do any more good than by simply raising the front. We have also tried Mr. Brown's plan of leaving the propolis quilt on; it is an excellent one. I think one of the greatest secrets is to have a good cellar.

REPORT OF COMMITTEE ON FOUL BROOD ACT.

Mr J. K. Darling presented the following report:

We your Committee *re* revision of "Act for the Suppression of Foul Brood among Bees" beg leave to report as follows:

That we have gone over the said Act section by section, and find that the Act is very complete.

We find that this Association, or its directors, have the sole power to appoint an inspector and a sub-inspector and that the sub-inspector has all the powers of the inspector when on duty.

Section 2 provides for the removal of an inspector at any time "for neglect of duty or other sufficient cause," and the appointment of a successor "without delay."

We find that the inspector shall "visit without unnecessary delay" any locality to which he has been directed by the President, but that there is nothing to prevent the inspector visiting any apiary where he believes there is any foul brood without being ordered to do so by the President; and that, while the Association has no power to appoint more than one sub-inspector, the inspector has power to call one or more assistants to help him in his work.

We find that Section 10 provides for a fine of $5 and costs for any person who fails to notify the President if he knows of foul brood in either his own apiary or that of his neighbor; but there is nothing in the Act calling for the divulgence of names to any other person except to the inspector.

Section 11 provides for the ascertaining of the good faith of the complainant before the Inspector is sent to his locality, and delays might be necessary to get fully informed on that point, and to make sure that the request for the inspectors has not come from a person "actuated by improper motives."

We also find that section 12, while making a general statement of what shall be included in the report submitted to the Minister of Agriculture, names only three special points, which are: "The number of colonies destroyed by order of the inspector, and the localities where found, and the amount paid the inspector for his services and expenses for the preceding year."

We would, therefore, submit that no action be taken at present toward securing any amendments to the above Act unless this Association deems it wise to appoint a committee to meet at some time during the coming year and go carefully over the sections of the said Act, and report at our next annual meet-

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ing any changes they may deem advisable; all the expenses of said committee to be paid by this Association.

All of which is respectfully submitted.

J. K. DARLING.
H. G. SIBBALD.
JOHN NEWTON.
J. L. BYER.
F. A. GEMMELL.

AFFILIATION PROPOSED.

BY G. C. CREELMAN, SUPERINTENDENT OF FARMERS' INSTITUTES, TORONTO.

It is an unexpected pleasure for me to be called upon to say a few words to you this afternoon. It is my pleasure to be connected with the Department of Agriculture, and a few days ago in conversation with the Hon. Mr. Dryden, and Mr. James, they suggested that as I had not been in the habit of attending the Ontario Bee Keepers Association, whereas it had been my privilege to attend the other Agricultural Associations of the Province, and that it would be a good idea if I would come up and get acquainted with, as they said, as good a lot of fellows as there are in the Province of Ontario. I am here to get acquainted; and probably from the fact that I do not know you, and do not know exactly what you are doing, except as I have read your reports and heard from you through the press, I may be able to say some things from an unprejudiced and outside standpoint that would have more weight than if I was in the ring, as it were, and intimately associated with you.

There never was a time in the history of agriculture in the Province of Ontario when farmers were so anxious for information as they are to-day. I am sure of that Last week only, in the city of Guelph, there were assembled 20,000 people from the farms of the Province of Ontario, to listen to addresses and to examine the products of the farm in the shape of live stock. There never was a time from eight o'clock in the morning till late at night when one-fourth of the people could be accommodated in the lecture room that had been prepared. Therefore you will understand why I say that there never was a time when the people of the farms were thirsting for knowledge along their own lines of work as they are to day. That class-room was kept constantly filled with people asking questions along the lines of bacon production, better beef, better mutton, better poultry for Canada. Those four topics particularly interested that great crowd of people. It seems to me that there is coming to be just as great a demand among the rank and file for a better knowledge in reference to bee culture as could have been said a few years ago in reference to some of these other industries.

Take our poultry industry. You will say all of our farmers keep poultry, but they do not all keep bees. That is true, but there is no industry that is independent of the other. Progress in one line makes progress in another. In the poultry industry a few years ago a few men bred fancy poultry for fancy purposes. Feathers were considered to be more valuable from their standpoint than flesh. A chicken that had a certain kind of a ring around its neck, or was of a certain color, was considered to be worth so much money; whereas if it did not have those special markings it was not worth anything like that. To-day we have come down to a more practical basis, and the chicken that is built like a Shorthorn, built to put on flesh, is the chicken which is being looked for in the market, and which breeders are coming to understand and beginning to

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breed for. As an illustration of that, at the Winter Fair, with which the Ontario Poultry Association is affiliated, there was, this year, one whole row of coops devoted to what we call the common-sense or ordinary breeds of table fowl, —Plymouth Rocks, Wyandottes, Brahamas and some of the others. There were hundreds of them where there used to be only a few in the show ring. So close is the competition that if a man comes in for the 8th or 10th prize he thinks he has done pretty well at that show. People are beginning to see if they can get from 10 to 15 cents a pound for plump fat poultry, well fed and of such a nature that you enjoy eating it; they find that is the kind of industry they want to devote themselves to.

The same thing might be said in reference to our bacon and other farm products which a few years ago were so despised on the English market. In the old country market a few years ago anything that was named Canadian in the line of pork was thought to be not at all comparable with the Danish or Irish. The Canadians have simply fought their way into that market by putting up a superior quality of product. Our men joined together and manufactured a good article and sent their men over with it, and placed it on the market and gave it to them in such a way that they were obliged to recognise that Canadians could produce just as good a quality of bacon as any one else. And conservative as the Briton is, sticking to his old line of eating Danish and Irish bacon, when he got a taste of our pea fed bacon he began to see Britain might just as well give us the trade and give us the money; and to day we are sending over from thirteen to fourteen millions of dollars worth of pork products to the English market annually, whereas a few years ago we were taking, as it were, only a few hundred dollars worth of their money. The same is true of cheese. The Englishman at one time did not use half as much as he does now; he depended upon the continent for it or he went to the United States. The Canadians said, we can produce just as good a quality of cheese as we can of bacon; our farmers are able to do it. The leaders of agriculture in Ontario said, our farmers are just as intelligent as the farmers in the old country, because they are from the same stock. We have the climate and cheap land and pure water; we can produce just as good a quality of cheese. Will you believe me when I tell you we have nearly seventy per cent. of the entire English market in cheese to-day. This year over twenty-five million dollars have been spent by the British people for cheese produced in the Dominion of Canada, and of course mostly in the Province of Ontario. We have got fifteen hundred cheese factories in this Province alone. The old country people are eating it, and liking it and saying, "We want only So-and-So's cheese" They want it from Perth, Middlesex, Simcoe or some of the other counties. They are cabling here for it, when they might write across the channel to the Holland and Danish people. That is proof positive that the English market is not so conservative, and that those people know a good thing when they see it. So if we can give them a taste of our best honey, and can give them not only a taste but get them to order quantities of it, there is no possibility of our over-doing the honey business in this country. I do not know that I am talking to a class of people who think that that is so, but most of our associations have fallen into the habit of grumbling a bit when there was not always occasion for it. Our fruit men a few years ago said "We must quit planting apple trees for there will be so many apples we will not be able to get ten cents a bushel for them, and then we will have to feed our apples to the pigs." They said there is no market. Why? Because Englishmen had not tasted our apples, as they have not yet tasted our turkey. But we said, "Although we confess there is not one in ten who has ever tasted our apples"—I am not speaking of the better class but of the rank and file of those great manufacturing towns—"we have got to supply that market."

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So we started them after our apples; they got a taste of them, and now what happens? We have one man in Ontario who got an order for one hundred thousand barrels of Canadian apples. Such a thing was unheard of ten years ago. Why have not apples gone up to be worth $5 a barrel? That is going too far, but I may tell you that those who have persistently sprayed and taken care of particular varieties, the varieties that the market demands, have never yet seen the year when they did not get a price for their apples which more than paid. Mr. Adam Harkness, of Iroquois, told me that they had never sold a barrel of apples this year for less than $3.50 on the Ottawa market—Macintosh Red and Fameuse, properly sprayed, free from scab, and bandaged for the codling moth—and so realizing a big profit. If the very best stuff is produced and the taste is educated, there is not any doubt that a market will follow for any of our farm products of Ontario. That being established, and I think you will agree with me that that is true, I want to say I would like to see, and the Department of Agriculture would like to see, the bee-keepers of the Province of Ontario spreading this information throughout the Province, so that the rank and file would get a better knowledge of the science of apiculture. There are too many farmers making a failure of bee-keeping; many try but few persevere in it. Nearly every one of us have started with a colony of bees. By some misfortune or good fortune I started into the bee business, but I found from reading somebody's book, or trying to find out about the theory that some little thing was left out, and by the time I wanted to gather in the honey the bees were dead; or when I had the temperature just right in the cellar something else was taking my attention; and I thought I could go in with my overcoat on or in my shirt sleeves, and I could test the temperature. Or somebody would come over to our place and say, "You fellows might just as well quit that, you can't raise bees; I have tried it and it is a failure." There is not enough definite information given to individuals through the Province of Ontario to reach every one who has a taste in that direction. Maybe it is not your fault. It is easy for anybody to get up here, and more especially for a young man like me, to get up and tell a lot of grey-headed men that they do not know what they are talking about. I have had enough experience to know that I do not know anything about the science of apiculture, except what I see and hear. But from my short experience I know that unless you put business methods into any line of business you are not going to make a success of it. The other Associations controlled by the Department with which I am connected are putting business methods into their Association work, and just in proportion as they are doing so they are getting returns. If the same practical work which was done at the Winter Fair at Guelph could be applied to the rank and file of bee-keepers, and you could have twenty thousand farmers present, and have them listen to your discussions and lectures what a great benefit it would be. Have your programme so arranged that a man would speak right to the point, and when he was through he would sit down, and the next fellow would not ask a question unless it was a pertinent one; and the next year have another program arranged along different lines so that your reports which you publish would not be the same. I picked up your reports for this year, last year, and the year before, and found there was the same lot of material to a large extent in every report We call that in an agricultural report a certain amount of padding—the same thing done over and over again. If you could have some practical demonstration instead of so much talk about how do this that and the other thing of how much more benefit it would be.

I never go to a fruit meeting that they do not have a lot of fruit. I came up here, and I thought I would see a lot of honey and a lot of bees. You people who come together from year to year know all about this sort of thing; but what an Association of this kind ought to do, unless you mean to have a

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revival meeting once a year and forget the religion of apiculture the rest of the year, is to make that meeting a great, big, rousing convention. There ought to be five hundred farmers here to-day. This court house ought not to hold the people. At Walkerton last year, we started to work the meeting up just as soon as the meeting in Cobourg was over the year before. I went up and around among the farmers and talked the matter over. I had an agent at each of the farmers' institute meetings. I wrote two thousand letters telling the farmers there was going to be a fruit growers' convention, and if they had any samples of fruit to be identified or if they had done anything of special importance to fruit growers, to bring the information in. Some fruit-growers came to me and said, "What kind of a meeting are we going to have at Walkerton? I am afraid of it." I said, "Don't you be alarmed; the meeting is going to be good or bad in proportion to the preliminary work." We selected a room that would hold five hundred, but they had to bring chairs into that meeting to put in the aisles. You can do it, and you ought to do it; and I would like to see the time come when the bee keepers of the Province of Ontario took the same stand along with the other live stock associations, so that you would have twenty thousand people pass through your gates to see what was being done. Maybe that is going a little too far. When I opened my address, I said that the people were hungering and thirsting for information. We are getting inquiries every day about bees. People want to branch out, and we find the younger people are growing up and asking for information concerning the common things that are about them, and I don't know anything amongst nature's studies better than to give a child a hive of bees. If the parents, if the older brothers—those of you who are here—could take those children along and get the school teachers interested and offer prizes for the best collection at the fall fairs, raised by the boys, of flowers, fruits and so on, I believe we would have such an awakening in apiculture that the amount of honey produced would exceed the demand; and if at the same time we carried along a package of tracts and kept the papers full of it from one meeting to the other, and kept talking honey, honey, in all our agricultural papers, a very great interest would be taken, and the demand would be increased. You have to keep these things before the people. As it is now there is so much lack of interest that the chopping down of a tree or having to feed the pigs will keep them away from the meeting; but if they have been thinking of that meeting for eight months or a year ahead, you would have a very much greater attendance. I think you men, who are thinking along these lines and who are using your brains to the very best advantage, are not doing enough. You are doing all this, but you do not get a chance to tell the great number of people about it; you are to a large extent wasting time. A great many have heard these things before that you are again talking about, and they are here for new inspirations and to see if they cannot advance along new lines.

I want to know how I can help you. As Superintendent of Farmers' Institutes I have in this vicinity five hundred members within a radius of twenty miles. I could have easily enough sent out a circular, co-operating with you, to reach the farmers, telling them there was going to be a bee-keepers' convention at Barrie. That may be the duty of your secretary, but he may not be in a position to do it. I would say to you, get in a closer touch with us in the Department of Agriculture, whereby we can do the same for you as for the other live stock men, the farmers' institutes, and the dairy men, and the fruit men. We do not get close enough in touch with you. Maybe it is our fault, maybe it is your fault; but between us we ought to get close enough together to help the bee industry. (Applause.)

I have talked it over with a few, and therefore, although it is only a thought, I will throw it out here for what it is worth. Could you come in closer touch by affiliating, not in the sense of being absorbed, with the fruit growers? I

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suppose if we were to take a vote in this meeting we would find that every one of you is more or less interested in fruit. I thought of it up there at the Walkerton meeting, and I was wondering if we had another room that would hold four or five hundred men, where the day could be devoted to apiculture and the evening to a combined meeting;—whether the fruit men and the bee men could work in together and make a great big convention? That might be possible. If that were brought about I believe, together, we could get better rates to the meeting, we could get bigger meetings, and take advantage of the same amount of advertising for both as we do for one. We know that we could get better newspaper facilities, because the press is pretty far-spreading so far as these things are concerned, and everybody is reached. Maybe in that way the department could assist you to carry out this work a little further. The Fruit Growers' Association this year took a step in advance. Each director was asked to bring in a written report of what he had done in his district for the fruit industry. It was wonderful how much they got around, and what they found out, when they learned they had to bring in a report. I do not know but maybe each one of your directors has read a report, or has given a verbal report as to what he has done for apiculture in his district. Maybe he did or did not, but if he did not I think it would be a good thing to inaugurate something of that kind. We found that some men in the Fruit Growers' Association said they did not propose to spend all their summer going through the district, and there was some instances where a man did not make much of a report. I do not know how it came about; but somebody else was elected as a director next year who would do that sort of thing, and the thing was brought about so that they got a live lot of men. I do not know anything about your directors, but no matter how live you may be unless you systematize your work, and have each man devoting his time between the conventions to working up something, you cannot accomplish very much. How much would you expect to learn of any line of business if you were only going to study it two or three days in the year? Supposing our school system was such that our children were only allowed one week in each year to go to school, we would not expect them to get much education. It is the same in your business; just as much brains are required to produce good honey as good goods of any other kind.

How can we systematize it? You say, "All our directors will want a salary." That is not the idea at all. In our Fruit Growers' Association the men do not get any salary; they take pride in being the man selected from four or five counties who is going to read the report. There is enough pride in the thirteen districts in the Province of Ontario, among the young men and among the older men, to select somebody who will do that sort of thing and work for the Association. The commission merchant can say, or the man who is handling produce can say, or the men in the Old Country who want to buy, can say, "I have read the Bee-keepers' report, I have found they are alive. I see two hundred names of men I can write to for reliable information on honey, and we can depend on getting so many carloads from Canada." Never mind whether it is sixty, or sixty-three, or sixty-six pound tins, or in a barrel or cask. But where can we get good honey and in large quantities? Will they write to me, and have they facilities, or have they a secretary who has facilities for doing this sort of thing? Are they big enough; are they paying him enough; have they got the right men in the directorate? All these things will rectify themselves if you will have a system of doing things in a business like way.

If there is any way by which the Department of Agriculture can help you to get better methods of working, or help you to work in with the other Associations, so that you may get some of the glory they are now getting, (because they seem to have started in the right direction) we shall only be

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oo glad to help you. I thank you for allowing me to take up so much of your time.

The PRESIDENT: I am sure you are all pleased with the address of Mr. Creelman. I might say we have made some endeavors to increase our membership and interest the public. During the present year we have sent out seven thousand circulars to bee keepers throughout the Province of Ontario, and we had hoped our membership would be largely increased, but, unfortunately, it did not seem to produce very much of a result. I was very anxious at this convention to have a practical demonstration of the various articles used in the production of honey; it would be an object lesson. We sent out invitations to all the supply men and dealers, and all those who had anything in that line to bring here for a discussion of the matter, and see the various operations performed. Unfortunately there was no response to that. There was one very good suggestion, and that is that after the date is fixed of the next convention we should let the Department of Agriculture know, and they will send out circulars in that particular locality of that meeting. I have no doubt that alone would bring a large increase of numbers to our convention, and I am satisfied, with the assistance of the Department, we will get a little more life into the Association, although we are not by any means dead; we are still able to sting.

Mr. FIXTER: There was another matter that Mr. Creelman touched on, and that was the market.

Mr. CREELMAN: What I meant to say when I came to the question of markets was that there would be a market for our honey just as we created a demand for it. I do not know anything about the prices of the honey or the markets in that way. What I meant to say was if we can start this campaign so that we can get everybody talking about bees; keep our papers and journals full of it, keep the windows of our best stores filled, and make a direct effort to get our honey in to take the place of the adulterated jams, marmalades, and that sort of thing, and get everybody to eat honey, the markets will look after themselves That is all I meant.

Mr. FIXTER: How are the Fruit Growers' Associations amalgamated with your department?

Mr. CREELMAN: It is not a question of amalgamation at all. They thought last year at Cobourg they were not getting as much out of the work, and the Department of Agriculture was not giving as large a grant of money as they should, and they thought if they could come in closer touch with us they could do something better. They asked me to go down to the Fruit Growers' Association and tell them something about how we were doing with our institute work. I gave them a talk, and then they requested the Minister of Agriculture to let me act as their Secretary. The Minister said if you want Mr. Creelman's time to devote to your work we will give you a small part of it, and we will employ a first-class clerk, and he will get out your annual report, and send out your circulars, and see the thing is boomed from beginning to end. And Mr. Creelman was so instructed, and he had to obey. We assisted the Fruit Growers' Association, and as soon as we began to do something, we went back to the government and said "We want some money." And the Department said "we are willing to give it to you." As long as they apparently were not doing anything, when they asked for more money, the Department would say, "What are you doing with the money you got?" "Well, we are doing just like we always did." "What do you want any more for?" "Well, we are going to do more." Mr. Dryden's policy is, "Don't tell me what you are going to do; go and do it, even if you run in debt, and if you have made decided advances I will help you out. Go ahead, do what you think ought to be done in this Association, and let us see if you can carry out what you propose." We

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have held three hundred orchard meetings this year right out in the open air ; started early in the spring with pruning, then spraying, and finally thinning, and so on. We had practical men out there ; the farmers said " Let us see you do these things ;' and they went around with the instructors from one orchard to the other. If you do that in the Bee-keepers' Association I believe you can come down to the Department and get anything you want, but you cannot until you start.

I do not know why the bee-keepers should not come along and take a part without in the slightest extent mimimizing themselves. It seems to me you would get as much glory as there was going, and at the same time get the benefit of the other organization. This may not be practicable for this assembly ; it is for you gentlemen to decide. Mr. Dryden will never coerce any Association into taking progressive measures. He tries as far as possible to express his views to the people, and then if they like to fall into line the Department is willing to give all the assistance it can ; but the request must come from you gentlemen direct. (Applause).

HONEY FROM CAPPED AND UNCAPPED COMB.

By F. T. Shutt, M.A., Chief Chemist, Experimental Farms, Ottawa.

The investigation into the nature of honey from uncapped comb—which we have termed here unripe or immature honey—was begun, as some of you will remember, in the season of 1901. Almost at the outset of the work we found difficulty. We endeavored to determine by chemical means the difference in composition between honey taken from full capped comb and that from comb which was only partially, and that altogether uncapped. I supposed from what I had learned that the difference, if there was any, would be chiefly in the proportion of water held by or contained in the honeys. Consequently, our first endeavor was to make an examination of these three classes of honey in order to get the moisture percentages. That is where our difficulty arose. I found almost at once that our results were extremely variable; that is, by employing the methods of analysis that were then in vogue the data were altogether unreliable. When I attended your convention last year at Woodstock, I could only present to you data of a tentative character. I could only give indications, and say in which direction I thought our work was pointing ; but I was not prepared to say that immature or unripe honey was such and such as regards its moisture content. I did, however, say two things : I stated, or aimed to indicate, that immature or unripe honey contained more moisture, probably between two and five per cent.; and there was another thing I felt pretty certain about, and that was that the published percentages of water in our honey as they had appeared in a government bulletin some two or three years ago were unfortunately unreliable. I remember I went into the discussion rather fully, and gave you the arguments, and my reasons for coming to that conclusion that those results were altogether too high—not all of them, but a very large number of them, were too high in their water content. Of course it was not intentional, as I pointed out at the time. I said the analysts whose work was represented in that report were good and true men, but that the methods which had been employed were not such as would rightly estimate the moisture, and the reason for that was that too high a temperature was being employed ; that the high drying temperature really meant decomposition of the honey,and the decomposed products passing off were estimated as water ; that is to say, they were recorded as water when they should not have been so.

We discussed somewhat the chemistry of honey. We showed it consisted really of two sugars,—dextrose and levulose,—and the levulose was the decomposible sugar. After the honey had reached a certain temperature decomposition

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set in, and the loss had been attributed to water content in the honey. That is the position we were in last year.

Early in the present year I resumed the work with the assistance of Mr. Charron, of the chemical staff of the Experimental Farm, and I am in a position to say fortunately that we have been successful in perfecting a method of analysis whereby we could accurately determine the moisture content in honey. I need not go into that matter in detail, because it is really a chemical question. The work was rather a laborious one, and took some two or three months—not all of our time, because I have very little time comparatively speaking, to devote to this class of work; but nevertheless it spread itself over several months. The results have been published in a paper before the Royal Society, and if any of you are sufficiently interested in it I should be pleased to send you a copy of the paper. I do not now propose to repeat the details of that research, but I may say briefly it amounts to this: Instead of drying the honey upon asbestos in the little glass tubes which I showed you last year and drying them in a steam oven at the temperature of boiling water, we are drying upon asbestos or upon sand and at a very much lower temperature, viz., 60° C. One hundred centigrade is the boiling point of water. We are also drying in a partial vacuum; the apparatus was improvised in our laboratories. I brought with me a copy of a photograph of the apparatus. At that temperature the honey can be completely dried without entailing any loss through decomposition of levulose. That being so, and all that being very satisfactory, we reverted to our old samples of 1901 and analysed them by this improved method, and upon this chart I have placed the results.

You will remember that among the honeys I brought to the convention last year there were samples from fully capped comb, from partially capped comb, and from comb entirely uncapped. Half the bottles of honey had been kept in the honey room—that is above ground—and the duplicates kept in the cellar of Mr. Fixter's house. There was also another feature which had been looked into, and that was the matter of the covering of the bottles. Half the bottles had been closed by glass stoppers, whereas the other half had been closed merely by cheese-cloth; so that we had honey kept in the honey room upstairs in glass stoppers, and cheese-cloth covered bottles, and similar samples kept in the cellar

TABLE I. Water in honey, 1901.

Comb.	Where kept.	Bottle closed with—	Date of extraction.	Date of analysis.	Water per cent.
Fully capped	Honey room	Glass stopper	Aug. 6th	Oct. 1st	15.46
"	Cellar	"	"	"	15 89
"	Honey room	Cheese-cloth	"	"	16.95
"	Cellar	"	"	"	15.84
Partially capped	Honey room	Glass stopper	July 1st	"	19.12
"	Cellar	"	"	"	20.68
"	Honey room	Cheese-cloth	"	"	20.63
"	Cellar	"	"	"	21.03
Uncapped	Honey room	Glass stopper	"	"	19 57
"	Cellar	"	"	"	19.24
"	Honey room	Cheese-cloth	"	"	18.25
"	Cellar	"	"	"	22 09

(Refers to chart) The first four results are from honey extracted from fully capped comb; the first two represent the honey as kept in the honey room and cellar respectively in glass-stoppered bottles; the second two represent the same honey kept in the honey room and cellar in cheese-cloth covered bottles. The date on which the honey was extracted, and the date upon which it was analyzed are given. I wish to direct your attention to one or two features without reading too much into my results. In the first place, you will notice that the percent-

age of water in this ripe or mature honey, as taken from fully capped comb, is somewhere between fifteen and sixteen per cent. I do not propose to say that all genuine ripe honey should be between fifteen and sixteen per cent; we have not done sufficient work on Canadian honey to make that statement definitely, emphatically and beyond denial; but I will say this, that during the last two years we have examined a large number of samples, and I have never found any honey with any such percentages as I quoted from that bulletin last year, where the water content went up to twenty-five and thirty-five per cent. I do not think that is at all possible in genuine ripe honey. The difference of half a per cent. may be omitted from consideration. There is very little difference between keeping it in the honey room and in the cellar, and we did not expect very much, because the bottles were closed with glass stoppers. When we come to consider those covered with cheese-cloth, there is certainly in one case a slightly higher percentage of water, and in connection with experiments which we have recently tried in regard to the storing of honey, we shall find an explanation for this fact, viz., that there is slightly more water in honey which is kept in a bottle merely covered by cheese-cloth as compared with honey kept in a hermetically sealed vessel.

TABLE II. Water in honey, 1902.

Comb.	Where kept.	Bottle closed with—	Date of extraction.	Date of analysis.	Water per cent.
All capped	Laboratory	Glass stopper	Aug. 7th	Nov. 6th	15.78
"	Apiary	"	"	" 11th	15.88
"	Laboratory	Cheese-cloth	"	" 6th	17.85
"	Apiary	"	"	" 11th	16.26
Partially capped	Laboratory	Glass stopper	July 7th	" 6th	16.58
"	Apiary	"	"	" 11th	15 33
"	Laboratory	Cheese-c	"	" 6th	15.31
"	Apiary	"	"	" 11th	15 90
Uncapped	Laboratory	Glass stopper	"	" 6th	17.13
"	Apiary	"	"	" 11th	16 33
"	Laboratory	Cheese-cloth	"	" 6th	17.56
"	Apiary	"	"	" 11th	16.18

Let us look at the honey from the partially capped comb. You will at once perceive that there is a difference in percentage of water from that of the fully capped comb. The average of the four results of the latter would be somewhere in the neighborhood of sixteen per cent; but you notice for the former that the percentage of water varies from nineteen to twenty-one, so that the average would be in the neighborhood of twenty per cent. We find from our improved method of analysis, therefore, a difference, in the season of 1901, of about four per cent. of water more in this partially capped honey than in the fully capped honey. Proceeding and looking at the honey from the uncapped comb, we find that the water content varies from 19.24 to 22.09, so that the average would be somewhere between twenty and twenty-one. The conjecture in this connection I made last year has been borne out by this chemical analysis, and I am very pleased that we have got such definite results. I wish to say one other thing about this; that not only does the immature honey contain more moisture, making it of poorer quality at the outset, but further that its keeping qualities are impaired. The honey readily spoils. Honey from uncapped and partially capped combs did not keep so long as that from fully capped comb. In fact I have never yet found any difficulty in keeping capped honey for any length of time. I was examining a sample of honey fourteen or fifteen years old, and it seemed to be just as good, as far as I could judge, as any fresh honey I have examined. But with regard to these immature honeys I found with the temperature of the laboratory anywhere between 65 and 70 degrees that in the

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course of a few months these honeys began to ferment. Undoubtedly the unripe honey has very poor keeping qualities. This, of course, points to the danger of putting such a honey upon the market, and also to the danger of mixing it with ripe honey. The honey season of 1902 was somewhat different, as you are aware, from the season of 1901. The work consequently was duplicated.

I now refer to the figures which we placed upon this second chart. There is only this difference, that we have not got the samples kept in the cellar. Half the samples were kept in the laboratory and honey room, and they are from capped, partially capped and uncapped combs, as in the year 1901. However, I should say this word about cellars. There are cellars and cellars, and with regard to this one in which Mr. Fixter keeps the honey; it is apparently dry, (and dryness is a great factor) or has air almost as dry as that of the honey room. These results no doubt would have been very different if the cellar had been damp, in which the air was moist. That will be very apparent to you when I call your attention to some figures upon this third chart upon the wall. But you must not think, from the results which are placed upon the 1901 chart, that you can keep honey uncovered in a damp cellar as well as you could keep it in a dry atmosphere. That inference must not be drawn from this chart.

In considering capped comb, this honey was extracted, you notice, about the 1st of August, and it was analyzed the first week in November—that is to say three months later. The percentage of water again in 1902 was between fifteen and sixteen per cent. You see how very similar it was to the honey we had in 1901. That bears out my conjecture that the percentage of water in normal ripe honey is somewhere between fifteen and sixteen per cent. The cheese-cloth covered bottles, you notice, contain slightly more moisture, 17 per cent. in one case and 16¼ in the other case; one kept in the laboratory, the other in the honey room. What does that mean? It means that the honey attracted moisture from the atmosphere. With regard to the partially capped and the uncapped comb honey, we do not notice that difference observable last year. In 1901 there was something like four per cent. but this year apparently the partially capped comb honey was of a very similar character. The only inference I can draw is that it is likely to vary acccording to the season. The results in experiments in storage of honey furnishes an explanation for that; it will depend upon the moisture in the atmosphere at the time.

The uncapped comb certainly shows a somewhat higher moisture content; it runs from 16.18 to 17.6 per cent., so that the average per cent. of water in the uncapped comb honey would be between 16 and 17 per cent. There is no doubt as to the better keeping qualities of ripe honey, and the fact that this immature honey will, if it is exposed to anything like a warm temperature, rapidly ferment.

Mr. LOTT: Relative to the honey produced in 1901, how do you account for the greater percentage of water in partially capped honey and uncapped?

PROF. SHUTT: Practically it has been due to the character of the season. I have brought the 1902 samples here, and they are numbered so that you do not know their origin; you may probably be able to judge from the appearance which are ripe and which are unripe, and I will tell you afterwards if you have made a correct judgment.

For one or two moments I am going to direct your attention to this chart No. 3. The question of the storage of honey is an important one, and I expected our work in connection with ripe and unripe honey would throw some light upon it, but in addition to those experiments just detailed I took some honey extracted from fully capped comb, which you will therefore call ripe honey, and I exposed it in a glass cylinder to the atmosphere of the laboratory, which at this time of

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the year in Ottawa is an exceedingly dry atmosphere. You know that the atmosphere in the winter time is always drier than in the summer time. The higher the temperature the more moisture air can hold. I took some of the same honey, and I exposed it in a similar glass cylinder to a very moist or saturated temperature. For this we took a large bell jar, and placed in it a flat dish of water; then making a little scaffolding or shelf over it, I placed upon it my honey in this cylinder, and put the bell jar over the whole thing and left it in the laboratory at a temperature of, we will say, 70 degrees Fahrenheit, and very soon that air took up as much moisture as it could from this dish of water. The air was saturated with moisture at that temperature. See the result upon the honey. The percentage of water in the original honey, 15.88; that which was exposed to the atmosphere for one month was 14.24. What does that mean? It means that the water has passed off into this dry atmosphere. But honey kept in a moist atmosphere contained 31.46 per cent; it had doubled its moisture contents.

TABLE III. Experiments on the storage of honey, 1902.

		Water, per cent.
	Ripe honey, from capped comb	15.88
A	" exposed to dry atmosphere 1 month	14.24
A	" " moist " 1 "	31.46
B	" " dry " 20 days	13.84
B	" " moist " 20 "	48.23

A: Honey placed in glass cylinder.
B: Honey placed in open evaporating dish.

In the next experiment, we exposed a larger surface to the atmosphere by pouring honey into a flat evaporating dish. You might term it a soup plate. One was kept in the laboratory exposed to the atmosphere and the other put under this bell jar also holding a vessel containing water. What was the result? In that exposed to the atmosphere we have 13.84 per cent. of moisture; it had lost a little more, as we might easily expect, by being exposed in the open flat dish than the honey in the glass cylinder. That kept in the open flat dish in this bell jar, in this moisture laden atmosphere, contained 48 per cent. of moisture. That was nearly one-half of water—more than three times the amount of water that the honey originally contained. I think that is very valuable result in indicating the necessity of keeping our honey in a dry atmosphere. This honey, as soon as it had absorbed this water began to ferment. The spores which are always present in the air, found a suitable medium in which to develop, and that honey fermented in the course of a very short time.

Mr. McEVOY: Did you test any comb honey on the same plan?

PROF. SHUTT: No; our experiments were upon extracted honey. We could not obtain comb that was not unbroken. The experiment would be of no value if the capping were not sound.

Mr. HOLTERMANN: Where the honey was kept exposed there in the winter it got drier, did it?

PROF. SHUTT: Yes. The winter atmosphere at Ottawa is very dry, probably much drier than at Toronto.

Mr. HOLTERMANN: I think, if I am not mistaken, I asked Prof Shutt to carry on those experiments some years ago, and I, of course, entirely agree with him. I believe he has done excellent work here. I have been able to get but very few bee keepers to agree with me in this way of handling honey; that is, when you extract your honey, strain it, put it up in your package and then close it at once. This idea that in average summer temperature you can dry honey, as it were, and evaporate it, is not correct. I am very much pleased, indeed, that Prof. Shutt, in these experiments, bears that out. You do not alone lose as far as the amount of moisture in honey is concerned, but you lose in the aroma of the honey. I am delighted with the work Prof. Shutt has done, and I think

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it will be of great value to bee keepers. And I hope that that will come not alone before the bee keepers of the Province, but before the consumers and buyers of honey, so that they will value more well ripened honey and they will know where to keep it and how to keep it.

Mr. MORRISON: Do you know whether that honey lost in flavor as it lost in its percentage of water?

PROF. SHUTT: I am not an expert on that, but you can try that, for yourselves. There is a practical part with regard to this matter, especially where honey is used for manufacturing purposes. If you buy a honey with thirty per cent. water you only get seventy per cent. of sugar, and if you buy it with fifteen per cent. water you get eighty-five per cent of sugar. Therefore, the manufacturer ought to discriminate between the qualities of the honey.

Mr. MORRISON: Would not that honey with thirty-one and forty-three per cent. of water ferment?

PROF. SHUTT: That is what I pointed out.

The PRESIDENT: Would it be possible that any moisture that collected on the inner side of the bell jar would drop directly into the honey?

PROF. SHUTT: That is a very large bell jar; there is no possibility of anything of that kind.

Mr. HEISE: Can Prof. Shutt tell us after a certain quantity of honey has absorbed that extra percentage of water whether the quantity would be increased to the same extent?

PROF. SHUTT: The weight increases, because we tried it in both ways. I do not know about the bulk; I did not measure it in that sense, but the weight increases directly as the amount of water absorbed is concerned, because there is nothing volatile about the sugars of honey.

Mr. DARLING: If comb honey is kept in a damp place the honey swells until it touches the cap and produces a dirty appearance. With regard to the matter that is under discussion at the present time, I tested some well ripened honey a few days ago, and it tested about 14½ pounds to the gallon. I figured out how much water it would take to make honey 13 pounds to the gallon. It takes about twenty-eight per cent. of water. That is, take one hundred pounds honey, 14½ pounds to the gallon, add twenty-eight pounds of water to it, ten pounds to the gallon, and you still have a honey thirteen pounds to the gallon, and the manufacturer who buys the best honey at ten cents a pound gets it cheaper than the one who buys the other at eight cents.

Mr. Gemmell moved, seconded by Mr. Holmes, that a hearty vote of thanks be tendered to Prof. Shutt, Mr. Creelman and Mr. Fixter, for the very excellent addresses given, and the assistance they have afforded to this convention, which, on a vote being taken, was declared carried, and the President tendered the vote of thanks to these gentlemen.

The President appointed Messrs. Sparling, Post, and Sibbald as a committee to examine Prof. Shutt's samples.

DIRECTORS' REPORT.

The Secretary presented the Directors' Report as follows:

The year 1902 has not been a year of abundant crops with many of us, but the quantity of honey secured has been up to or above the average.

The usual sum of $200 was set apart for affiliated societies, of which $180 has been paid according to by-law.

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The usual grants of $25, $10, and $10, were made to the Toronto Industrial, Western, and Central Canada Fair Associations respectively.

About $45 has been expended in securing and sending out circulars regarding spraying fruit trees; also circulars showing the usefulness of the O. B. K. A.

The executive interviewed the Hon. John Dryden regarding the expunging of the word "full" from the Act respecting spraying fruit trees, and he was not favorable to any change.

At the request of the Manufacturers' Association a small quantity of honey was secured and forwarded to be placed in the exhibits at Cork, and at Wolverhampton. The thanks of this Association are due to the Manufacturers' Association for their efforts in this matter.

The financial condition of the Association is in about the same condition as last year, as you will perceive from the reports presented by the Secretary and Treasurer.

The Canadian Bee Journal has been given to each member of the Association as well as a copy of the annual reports.

Upon motion of Mr. Darling, seconded by Mr. Brown, the report was adopted.

FINANCIAL STATEMENT

Of the Ontario BeeKeepers' Association, made to the Department of Agriculture for the Province of Ontario for the year ending December 16th, 1902.

RECEIPTS.		EXPENDITURE.	
Cash on hand from previous year	$100 36	Grants to other Societies, Fairs, etc.	$225 00
Members' fees	132 00	Expenses for Conventions, etc.	10 00
Legislative Grant	500 00	Officers' salaries	75 00
Affiliated Societies' Fees	45 00	Directors' fees and expenses	203 80
For use of stenographic report	12 00	Postage	25 58
		Printing	36 90
		Advertising	29 35
		Periodicals for members	85 80
		Reporting	50 00
		Executive and Revising Com. expenses	28 50
		Auditors	4 00
Total	$789 36	Total	$773 93
		Balance	15 43

Examined and found correct this 17th day of December, 1902.

H. C. SIBBALD, DENIS NOLAN } Auditors.

J. D. EVANS, Chairman.
MARTIN EMIGH, Treasurer.

Mr. Post moved, seconded by Mr. Darling, that the report be adopted. Carried.

AFFILIATED SOCIETIES REPORT.

The following Associations have sent their reports as to their financial affairs and the grants that they have received have been expended largely as the by-laws governing such direct.

The reports of bees and production of honey are not full by any means, and it is impossible to report fully.

Societies reporting: York, Simcoe, Norfolk, Brant, Haldimand, Glengary, and Russell.

There are two societies that the reports have not been received from yet.

W. COUSE, Sec.

P.S.—After the annual meeting the reports of the two societies were received namely, Oxford and Halton district.

Upon motion of Mr. Brown, seconded by Mr. Post, the report was adopted

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INSPECTOR OF APIARIES' REPORT.

During the season of 1902 I visited bee yards in the Counties of Huron, Middlesex, Perth, Brant, Wentworth, Lincoln, Welland, Halton, York, Cardwell, Grey, and Simcoe. I inspected ninety-one apiaries and found foul brood in thirty of them, and dead brood of other kinds in many others which had been mistaken for foul brood. I also found several fine apiaries completely cured of foul brood that had been reported to be diseased.

The frequent showers that we had in the early and middle part of the past honey season kept the bees in their hives for hours at a time, and this taking place when the bees had a very large quantity of larvae to feed, caused a rapid using up of the storage. As fast as the cells were emptied the queens layed in them, and soon after that all brood chambers became full of brood; and as they were left in that condition, with the bees being driven in from time to time by the rains, which were followed by sudden warm spells, this brought on the greatest rage of swarming ever known in the Province of Ontario, and created a great demand for comb foundation. Some bee keepers, not having any on hand, and not expecting to get any very soon, used some old combs (that were saved from colonies that had died from disease) and spread the genuine article, a thing the same parties will never do again.

All old diseased combs should be melted and put through a wax press, as that is the only kind of an extractor that will take all the wax out of old combs.

It would greatly improve the apiaries in many localities if their owners would use more foundation, and melt a part of their old combs each year until they were all renewed.

While on my rounds through the Province I was much pleased with the very generous treatment that I received from every bee keeper.

My time, car fare, and livery hire was $748.60

Woodburn, Ont., Dec. 16, 1902. WM. MCEVOY.

QUESTION DRAWER.

Q. Is it advisable to supply moisture in cellar wintering in the case of a very dry cellar?

Mr. ARMSTRONG: I do not know; I am not a cellar winterer.

Mr. HOLTERMANN: We hear a great deal about cellars being moist, and the whole tenor of conversation seems to be in the direction of dry cellars. It is a subject, I believe, that is very important, and a subject that but few, if any, can say very much about. I would simply give my opinion, and say that the danger of having the cellar too dry is just as great as having it too moist, and what should be done is make a line of careful investigation under proper conditions where there is a wet and dry bulb thermometer, and where the humidity of the atmosphere can be taken, and then find out what there is in that question.

Mr. DICKENSON: I think it ought to be satisfactory to most of the bee keepers to know they are successful, and bring out their bees in cellar wintering. I feel I can winter my bees as well as any stock man can his stock.

Mr. SIBBALD: I have always preferred a dry cellar, and as I have had quite a large experience in getting a cellar at the different places where I wanted it, I have learned to take almost any cellar and make it right. If it is a large cellar, partition it off so that the bees will have a small place, and I do not know

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how it is or how it works out, but they seem to be able to keep it dry. As long as it is not frosty I do not care how dry it is. If it is damp—I have had water on the floor—just floor it over with boards so as to keep it underneath. I have not seen any difference in the results doing it that way. I wintered once in a large cellar that was damp and they got very moist, and the water was dropping out of the hives before the spring, and they were mouldy, and I partitioned off that same cellar, and I got excellent results. If it is under a dwelling I have never ventilated it. If it is an "out" cellar, where there is no heat above, I make quite an opening in the floor and then put straw and cover that over with chaff or sawdust, and only the air will escape through the straw.

Mr. HOLTERMANN: There is another point we want to be very careful about. Some people think they have got damp cellars when they have not got them. What I mean is when they have got moisture on the walls it may not be at all damp; the only really accurate test as to humidity is the wet and dry bulb thermometer. I believe that about two degrees between the wet and dry bulb is, as far as I know at present, pretty nearly right.

Mr. POST: I have found two degrees to be the nearest I could get. I keep three in my cellar, and I always like to keep them two degrees apart.

Q. Is it safe to use again extracting combs that have been used over a colony slightly affected with foul brood, said comb having been used over a queen excluder, and never having had any brood therein?

Mr. ARMSTRONG: I would say not use them.

Q. How to liquefy honey in pound bottles?

Mr. ARMSTRONG: My plan of liquefying is to have quite a large pan that reaches clear across the stove. It is about eighteen or twenty inches wide and four inches deep. I have a frame that goes down into that made out of slats, about $\frac{3}{8}$ths of an inch wide, and I drop that slatted frame down into the bottom or into the water first, and then set my jars on top of that, loosen up the corks or screw tops, but I do not bring the water to boiling point while the honey is in there. You can see when the honey is all melted; and when that is so I seal that up tight, and that honey will stay liquid for a year or two years. I have got some now I have had in that shape for one year, and you cannot see a particle of granulation at all.

Q. How do you prevent moths from getting into the hives?

Mr. ARMSTRONG: Keep strong colonies. I have no difficulty myself.

Q. How many Langstroth frames will an average queen occupy?

Mr. ARMSTRONG: I would say about seven.

Mr. HOLTERMANN: I believe that the average queen will occupy a good deal more room than one thinks. I do not know just what an average queen means; it is pretty hard to say, but I find that there is a goodly portion of the season where a queen will fill a ten-framed hive full with just as little honey left in it as an eight-frame. There seems to be a good deal in this. The queen is crowded by the bees to a certain extent with honey, and she will fill to the extent of the room given her.

Q. When it is desired to supersede an old queen, would it be practicable to substitute a virgin queen at the time by making a forced swarm or a natural swarm?

Mr. ARMSTRONG: I have never done anything alone that line myself I cannot say.

Mr. CHRYSLER: I have, and it will not work.

Q. Do you think there is much risk of moving colonies in hives six miles on a sleigh at this time of the year?

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Mr. ARMSTRONG: I never did any of that either. I have moved them almost any other time of the year but in the winter.

Mr. HOLTERMANN: We had a very extensive experiment along that line last fall. We had a carload of bees in New York State, and they were brought to the cars in sleighs. They were two days on the road, and they were hauled a couple of miles on wagons at Brantford. They reached there in November, and they were outside for a week or ten days. After that they were put into the bee cellar, and in the spring there was not, as far as I know, one case of dysentery in one of the hives. I know Captain Hetherington in the past had said it can be done, but I confess I felt pretty anxious. I wondered if there would be a single stock alive in the spring. When we tore one of the bees to pieces there was a globule of watery matter in the bee which I believe was the beginning of the dysentery. When I got the bees in the cellar I made a fire and raised the temperature up to sixty-five or seventy degrees for two weeks, and when I found that that globule was dried out I lowered the temperature.

Q. Would it pay to buy some queens in the spring and kill some failing ones?

Mr. ARMSTRONG: I would say yes.

Q. Will a queen lay drone eggs before she is twenty-one days old and then lay good eggs?

Mr. ARMSTRONG: I will agree with the Inspector of Apairies that I would pinch the head off that queen right away.

Mr. CHRYSLER: I would say that I would not be positive with regard to the queen laying those drone eggs. It might be fertile workers before the queen got ready to work.

Q. Will bees leave the extracting supers if set off the hives in the morning, or is it necessary to handle each frame and brush the bees off? Should the smoker be applied?

The PRESIDENT: I suppose the idea of that question is if the super is taken off and laid down beside the hive, will the bees desert it without smoke?

Mr. ARMSTRONG: I believe there would be quite a number of bees in it; the old bees likely would all leave but a certain number of young bees, I think, would not.

Mr. DICKENSON: I would say there would be no difficulty in adopting that system when the honey flow is on. I think any man who has tried it will find that it has worked.

Q. If you have a large number of extracting combs in number one condition, and wish to change to a slightly larger size, would you cut the combs to fit the larger frames or would you melt them up?

Mr. ARMSTRONG: As far as I am concerned I never did a great deal of that kind of thing, but if it was much of a change and the frame was much larger I think I would melt the combs up and have them made into foundation and put the foundation into the frames.

The PRESIDENT expressed his satisfaction with the support afforded him during the past year, and said that he thought it had been a very successful one, and he would now resign in favor of Mr. Chrysler, whom he was sure would make an excellent President.

President Chrysler took the chair and, after expressing thanks for the honor conferred upon him, called upon Alderman Plaxton and Mayor Boyes of Barrie, who addressed words of welcome to the Association, which were greeted with hearty applause.

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COMMERCIAL ORGANIZATION AMONG BEE KEEPERS.

By W. Z. Hutchinson, Flint, Mich.

Nothing is truer than the fact that times and conditions change. Regarding the conditions and peoples of this continent in ages past, we have little else than conjecture, but, so far as the present race is concerned, there came, first, discovery; then, settlement; the clearing away of the forests and the building of homes. Nearly all that was accomplished was the result of individual effort; and mainly with bare hands, unaided by machinery. Next came labor saving machinery, and the beginning of organization in the shape of factories. At first there was much opposition to machines. "They robbed men of an opportunity to labor." But then, as now, opposition to progress is useless. The wagon-maker who made wagons by hand, sawing out the felloes and shaving out the spokes, found it simply impossible to compete with the factory with its system of specialty, organization and machinery. The individual wagon-makers may have protested against organization, just as some of us now protest against the great organizations called "trusts"; and it is probably true that it inconvenienced them temporarily, and caused them to seek other employment, but the great mass of people who use wagons were benefitted; and so were the individual wagon-makers benefitted by this same process being introduced into the production of nearly everything they were compelled to buy.

This country has now reached what might be called the age of organizations, and the industry that fails to catch the true spirit of the times, and act accordingly, will eventually find itself in the position of the man who would now attempt to make wagons by hand. Organization begets organization—in fact, *compels* it. When the mine owners organize, the laborers must do likewise, or be crushed. There is more than one industry in this country that would have been crushed out of existence had not the men who were engaged in it organized.

The best illustration I ever heard regarding the effect and value of organization was the act of an old man whose large family of boys failed to live and work in harmony. He gathered up a handful of sticks equal in number to his number of boys, and, tying them up in a bundle, gathered the boys in a group, and said he would like to know if he had a son strong enough to break the bundle of sticks. Each in his turn put the bundle over his knee and strained with all his might to break the united strength of the sticks. All to no purpose. The father then untied the bundle, and handed a stick to each boy, saying: "Let's see if any of you are stout enough to break one stick." One contemptuous jerk of the stick across his knee was the emphatic answer of each boy.

It is not necessary to repeat the sermon that the old man proceeded to preach to his sons, but it is well that we take the lesson to heart.

As we are now selling our product, we are competing one with another. We do not exhibit the business sense of even that despised class of people, the saloon keepers. They never cut prices. With them, so I have read, and have been told, the price of a glass of beer is always five cents. With us the price of a pound of honey is that at which our poorest or most unfortunate member is compelled to sell, as he must have the money.

I doubt if there is a bee keeper in this country, one who has given the matter serious thought who does not believe that the time has come for national commercial organization. It seems as though it were time wasted to discuss its desirability, that we are ready to talk about the *how*. On this point we should gather wisdom from the past. How have other organizations been born, grown,

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and brought up? Most of the great industrial organizations have resulted from amalgamations of smaller organizations; and they in their turns, were made up of individuals. First there was the individual wagon-maker, then the individual factory, so to speak, then organizations of the factories into one immense combination, or trust.

Such organizations as life insurance companies begin with a strong central office, from which agents or organizers are sent out to establish branches. One method is that of gathering together small organizations, and uniting them under one great head; the other is the opposite, that of a central society spreading out and starting branches.

Which plan is the most feasible for bee keepers? Colorado has an organization. California is working to establish one. Canada has in contemplation a similar one. Shall California and Canada succeed, and New York and Texas follow suit, and then shall these already successful organizations be united, or shall some strong central society, like our present National Association, reach out and establish branches?

Right here it might be well to say that our National Association, as now organized, is not fitted to take up the commercial feature of organization, but its influence and machinery can be used to assist in the starting and fostering of a commercial branch or organization.

Some have opposed organization on the ground that it would be a trust. If it is an "Organization" or an "Exchange," it is all right, but they want nothing to do with a *trust*. Let us not be deceived by a jugglery with names. An organization, or an exchange or a trust, it matters not what it is called, is a combination, or joining together of individuals, or firms, as corporations, for the benefit of its members. It is not necessary, nor desirable that such benefit shall work hardships or injuries to the public. It may lessen cost of supplies, prevent the lowering of prices from forced sales by poor men, save freight charges by gathering car load lots, and prevent gluts by means of statistics and proper distribution.

It can do all this without raising the retail price of honey.

The great question at present is: "How shall we do it?" Let us discuss it.

Mr. SIBBALD: I agree with the idea of Mr. Hutchinson, and I believe that organization would be a very great benefit to the bee keepers of Ontario; but, as this is a matter which is to come up the first thing in the morning, I do not think we ought to say very much about it to-night. I would, however, move, seconded by Mr. McEvoy, that a vote of thanks be tendered to Mr. Hutchinson for the trouble he has taken in sending such an excellent paper.

The President put the motion, which was carried.

Mr. Lott moved, seconded by Mr. McEvoy, that this Association tender to Mayor Boyes and Alderman Plaxton of Barrie a vote of thanks for the excellent addresses which have been given. Carried.

Prof. Shutt stated that both he and Mr. Fixter would be pleased to have suggestions made as to experiments to be conducted at the Experimental Farm at Ottawa during 1903.

After some enquiries, and a short discussion on the question of the adulteration of honey, Mr. McEvoy, moved, seconded by Mr. Miller, that Prof. Shutt and Mr. Darling be a committee to interview the Minister of Inland Revenue, produce some samples, and see if some pressure cannot be brought to bear to procure a thorough investigation to be made with regard to the adulteration of honey.

The President put the motion, which, on a vote having been taken, was declared carried.

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ONTARIO HONEY EXCHANGE.

The President then read the following report of the Committee on Honey Exchange:

This Association shall be called the Ontario Honey Exchange, and a commercial part of the Ontario Bee Keepers' Association, and shall include in its jurisdiction the Province of Ontario, with such additional territory as from time to time it may be found feasible to organize.

Its object is to establish a reliable and fair market price for the product of its members, the more proper distribution of honey, and to establish, when advisable, foreign and distant Canadian markets.

The main officers of the Exchange shall consist of five directors, elected by the members of the Ontario Bee Keepers' Association at each annual meeting, and to hold office for one year, and shall direct all business of the Exchange.

As soon as elected, they shall elect from their number a President, Vice-president, Secretary, Treasurer, and Business Manager, and shall be known as the officers of the Ontario Honey Exchange.

They will choose a location, and obtain by rental or otherwise a suitable office and warerooms in some central city, and that shall be known as headquarters.

They shall, where feasible, appoint one or more persons to organize each district that is not already organized into a District Branch Association, and shall be affiliated with the Ontario Bee Keepers' Association.

To all such affiliated societies instructions will be given from the main office for the collecting of honey, wax, &c.

The Local Affiliated Societies may elect from their number one who shall be called a local manager, who shall be made responsible to the local Association, and that to the main office, for all moneys and goods he may be entrusted with.

It shall be the duty of the local Association to appoint its secretary or local manager, to obtain statistics of honey, bees, &c., in his district when called upon by the general manager to do so, and shall include other information, such as estimates of the amount of honey produced, the amount that members will require to sell to consumers, and the retail trade on their own account, and the amount likely to be placed in the Exchange; also, if a shortage in the district, the amount that could profitably be shipped in.

Members in unorganized districts in any part of Canada shall also be requested from head office to report on the honey crop and estimates similar to local Associations.

In case some may not wish to join either the local Association or Honey Exchange, the local manager or a member may offer them within a business margin of the selling price of honey, and place it in the Exchange on his own account, or as his own honey. (He will have the privilege of receiving an advance in money on his producing a warehouse receipt.) They will not then sell to others for a less price.

Funds may be advanced to members by the Exchange to the amount of three-fifths of the value of honey consigned and charged the current bank interest.

The directors of headquarters of the Exchange, on obtaining crop reports from the local Associations and others, shall set the prices of the different grades of honey for a certain period; at the end of such time specified they may lower, raise, or maintain same prices as the market will warrant.

All honey sold by the Exchange shall be graded according to rules adopted by the Ontario Bee Keepers' Association.

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Honey sold from the local manager's warerooms, and also that of headquarters, must be graded by the member supplying it, and re-examined and graded, if necessary, by the manager in each warehouse.

All honey received by the Exchange for sale must be branded and sealed by the stamp of the Ontario Honey Exchange, and backed by a good, strong guarantee.

The duties of the President, Vice-President, Secretary, Treasurer, and Business Manager shall be arranged by the Provisional Directors as circumstances will admit, until the constitution and by-laws are thoroughly revised and amended ready for incorporation.

The remuneration of the five commercial directors shall be determined by the directors of the Ontario Bee Keepers' Association, and shall be taken from the dues and profits of goods handled.

It should be the object of the Exchange to place the honey as near as possible to the consumer, saving extra transportation and commission for its members.

The funds for carrying on the Exchange will be obtained by plans and in a manner advised by the directorate.

Mr. H. G. Sibbald outlined with some particularity the formation of a honey exchange, and after some discussion he moved, seconded by Mr. McEvcy, thae the members of this Association present, at the close of the Convention, assembl- in a public meeting for the purpose of organizing an association for the markett ing of honey, and he included in his motion the adoption of the report.

The President put the motion, which, on a vote having been taken, was declared carried.

Mr. Evans moved, seconded by Mr. Holtermann, and it was resolved, "That this Association will co-operate with the directors of the Industrial Exhibition at Toronto in making the Dominion Exhibition, to be held by them, a success, and that the President and Secretary forward a petition to the Dominion Government, asking them to give financial aid to the said Exhibition."

Mr. Newton moved, seconded by Mr. Evans, "That the hearty thanks of this Association be tendered to the Mayor of Barrie, and also to the Warden of the County of Simcoe, for the generous use of the rooms for the holding of the meetings of the Convention, and also to the local Bee Keepers' Association, for the kind way in which the members have been entertained while in their midst." Carried with applause.

Mr. FIXTER: Has anything been thought of or done in connection with making an exhibit at the St. Louis Exhibition? I saw the Commissioner of St. Louis just before I came away, and he told me they wanted to make as good an exhibition as possibly could be made. They had not any plans as yet as to how that would be carried out, but that would be arranged in due time. In our own case we propose at the Experimental Farm to prepare for that. We propose to go into it more extensively at this exhibition than we have at the other.

Mr. EVANS: We were caught short at the Buffalo Exhibition, because we did not know in time, and it comes rather late for next year's crop of honey. We do not meet again till next year, and if we have to select from the crop of 1904 it will be too late. I would move, seconded by Mr. McEvoy, that the Executive be empowered to take any action they think best in making an exhibit at St. Louis in 1904. Carried.

Mr. FIXTER: There is a matter of uniting more closely with Mr. Creelman's office It may be a little out of order for me to say anything about the matter, but I feel a great deal of good can be done through his office in

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organizing and advertising the meetings of this Association and assisting in getting out programs. They have their full time at their disposal and their thought is entirely on organization, and I feel the time has come when their assistance will be of great benefit to this Association. We heard the very excellent address of Mr. Creelman yesterday, and we know the results of their labors in the past; that any society or association they have taken hold of has increased wonderfully. I feel that the time has come, and if the members of this Association would see fit to empower the executive committee to communicate with him I think it would be a step in the right direction. Therefore I would move, seconded by Mr. McEvoy, "That in the opinion of the members of this Association it is highly desirable that the assistance of the Department of Agriculture for Ontario, as offered through Mr. Creelman, Superintendent of Farmers' Institutes, towards better organizations and furthering the interests of this Association generally be accepted, and that the executive committee be hereby requested to correspond with Mr. Creelman towards that end." Carried.

Mr. FIXTER: I hope to look after our end of the business at St. Louis Exposition pretty well, because I am in close touch with the Commissioner, and I hope that we may make it the best exhibit of honey that has ever been put up. We are looking that way, and it has been my aim and my object to create a foreign market when we get our own market supplied. I think by keeping our products before the country, when the time comes to look up the market those people will remember the nice and tasty exhibits we have put up. I hope to try and assist this Association at our end of the line, and make this exhibit a success.

Mr. SIBBALD moved, seconded by Mr. Holtermann, "That the executive committee be empowered by this Association to use their judgment in the matter of granting an appropriation to the Association to be formed, called 'The Honey Exchange,' if such an exchange be formed." Carried.

Mr. MCEVOY moved, seconded by Mr. Brown, "That the *Canadian Bee Journal* be the premium for the coming year." Carried.

Re Mr. Hall's request to be discontinued as a life member, Mr. Sibbald moved, heartily seconded by Mr. McEvoy, "That this Association do not accede to his request, but that the Secretary write to him and state that it is the feeling of this meeting that the Association wishes to retain him as a life member, and are quite willing and do now authorize the Secretary to pay for the *Canadian Bee Journal* for him. Carried.

The business of the Association having been concluded, the Convention closed.

The annual banquet of the Association was held in the Queen's Hotel, on Wednesday evening, and was an enjoyable affair.

DIRECTORS' MEETING.

At the directors' meeting after annual meeting, W. Couse was re-elected Secretary; Martin Emigh, re-elected Treasurer.

The usual grant of $200 was made for the affiliated societies.

The grants of $25, $10 and $10 were made respectively to the Toronto Industrial Exhibition Association, the Western Fair Association of London, and the Canada Central Fair of Ottawa.

It was decided to present the members of the Association with the *Canadian Bee Journal* for the current year.

The executive committee were empowered to give any additional assistance they may deem wise to the Dominion Exhibition at Toronto.

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The Secretary was directed to return the dollar sent in by Mr. J. B. Hall as a membership fee.

The caretaker of the hall where the meetings were held was given $2.00.

The President, Vice-President, 2nd Vice-President and Secretary were appointed the executive committee.

The executive committee were empowered to pay any incidental expenses during the year, to arrange the programme for next annual meeting, fix the date of meeting, and to use a sum of money not to exceed $50 to assist in forming the honey exchange if necessary.

W. COUSE, Secretary.

CANADIAN HONEY EXCHANGE.

At a public meeting of bee keepers in the court house, Barrie, Ont., Dec. 18th, 1902, it was decided to form a Honey Exchange.

The following directors were elected:—C. W. Post, Trenton; W. A. Chrysler, Chatham; W. Couse, Streetsville; John Newton, Thamesford; H. G. Sibbald, Claude.

The directors elected their officers as follows:—H. G. Sibbald, president; W. A. Chrysler, vice-president; W. Couse, sec.-treasurer.

The object of the Exchange is to collect as correct reports as possible of the honey crop of all bee keepers in the Province, to sell honey at as uniform price as reasonable, to prevent the honey from being delivered in unequal quantities at any points, to try and ship honey in car lots to save freight, to have all honey properly graded and sold according to value, and to promote the general interests of the bee keepers of Ontario. A membership fee of over one dollar will entitle any bee keeper to assist in this undertaking.

W. COUSE, Secretary,
Streetsville.

AN ACT RESPECTING THE RIGHT OF PROPERTY IN SWARMS OF BEES.

R. S. O., 1897, Chap. 117.

1. Bees living in a state of freedom shall be the property of the person discovering them, whether he is or is not the proprietor of the land on which they have established themselves.

2. Bees reared and kept in hives shall be private property.

3. Where a swarm of bees leaves a hive the owner may reclaim them, so long as he can prove his right of property therein, and shall be entitled to take possession of them at any place on which the swarm settles, even if such place be on the land of another person, but the owner shall notify the proprietor of such land beforehand and compensate him for all damages. If a swarm settles in a hive which is already occupied, the owner of such swarm shall lose all right of property therein.

4. Any unpursued swarm which lodges on any property whatsoever, without settling thereon, may be secured by the first comer, unless the proprietor of the land objects.

5. If the owner of a swarm of bees declines to follow the swarm and another person undertakes the pursuit, such other person shall be substituted in the rights of the owner, and every swarm which is not followed shall become the property of the proprietor of the land on which it settles, without regard to the place from which it has come.

AN ACT FOR THE SUPPRESSION OF FOUL BROOD AMONG BEES.

R. S. O., 1897, Chap. 283.

1.—(1) The Ontario Bee Keepers' Association shall at each annual meeting, or the directors of the said Association shall, if in the interval between two annual meetings the occasion arises, appoint an Inspector of Apiaries and a Sub-Inspector for the Province of Ontario, and the said Inspector and Sub-Inspector shall be elected by the vote of the majority of the members of said Association present at the annual meeting, or the vote of the majority of the directors as the case may be. Any annual meeting may delegate the annual appointment of an Inspector and Sub-Inspector to the newly elected Board of Directors.

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(2) The said Sub-Inspector may, when so directed, as hereinafter provided, perform all the duties and exercise all the powers in this Act directed to be preformed or exercised by the Inspector, and the provisions of this Act relating to the Inspector shall be deemed to apply to and include the said Sub-Inspector.

(3) The Inspector or Sub-Inspector on entering on any premises in the discharge of his duties shall, if so required, produce the certificate of the President of the said Association that he has been appointed as such Inspector, or Sub-Inspector, as the case may be.

2. The said Inspector and Sub-Inspector shall hold office for one year from the date of the annual meeting at which they were appointed, or if they are appointed by the directors, then until the next annual meeting after such appointment and shall be eligible for re-election, but the said Inspector or Sub-Inspector may at any time, subject to the approval of the Lieutenant-Governor in Council, be removed from office by the directors for neglect of duty or other sufficient cause, and in case of such removal the directors shall without delay appoint a successor.

3. The said Inspector shall, whenever so directed by the President of the Ontario Bee Keepers' Association, visit without unnecessary delay any locality in the Province of Ontario, and there examine any apiary or apiaries to which the said President may direct him, and ascertain whether or not the disease known as "foul brood" exists in such aspiary or apiaries, and wherever the said Inspector is satisfied of the existence of foul brood in its virulent or malignant type, it shall be the duty of the Inspector to order all colonies so affected, together with the hives occupied by them, and the contents of such hives, and all tainted appurtenances that cannot be disinfected, to be immediately destroyed by fire under the personal direction and superintendence of the said Inspector, and after inspecting infected hives or fixtures, or handling diseased bees, the Inspector shall, before leaving the premises, or proceeding to any other apiary, thoroughly disinfect his own person and clothing, and shall see that any assistant with him also thoroughly disinfects his person and clothing; but where the Inspector, who shall be the sole judge thereof, is satisfied that the disease exists, but only in milder types and in its incipient stages, and is being or may be treated successfully, and the Inspector has reason to believe that it may be entirely cured, then the Inspector may, in his discretion, omit to destroy or order the destruction of the colonies and hives in which the disease exists.

4. The Inspector shall have full power, in his discretion, to order any owner or possessor of bees dwelling in the box-hives, in apiaries where the disease exists (being mere boxes without frames), to transfer such bees to movable frame hives within a specified time, and in default of such transfer the Inspector may destroy, or order the destruction of, such box hives and the bees dwelling therein.

5. Any owner or possessor of diseased colonies of bees, or of any infected appliances for bee-keeping, who knowingly sells or barters or gives away such diseased colonies or infected appliances, shall, on conviction thereof before any Justice of the Peace, be liable to a fine of not less than $50 or more than $100, or to imprisonment for any term not exceeding two months.

6. Any person whose bees have been destroyed or treated for foul brood, who sells or offers for sale any bees, hives or appurtenances of any kind, after such destruction or treatment, and before being authorized by the Inspector so to do, or who exposes in his bee-yard, or elsewhere, any infected comb, honey, or other infected thing, or conceals the fact that said disease exists among his bees, shall, on conviction before a Justice of the Peace, be liable to a fine of not less than $20 and not more than $50, or to imprisonment for a term not exceeding two months, and not less than one month.

7. Any owner or possessor of bees who refuses to allow the Inspector or his assistant or assistants to freely examine said bees, or the premises in which they are kept, or who refuses to destroy the infected bees and appurtenances, or to permit them to be destroyed when so directed by the Inspector, may, on the complaint of the Inspector, be summoned before a Justice of the Peace, and, on conviction, shall be liable to a fine of not less than $25 and not more than $50 for the first offence, and not less than $50 and not more than $100 for the second and any subsequent offence, and the said Justice of the Peace shall make an order directing the said owner and possessor forthwith to carry out the directions of the Inspector.

8. Where an owner or possessor of bees disobeys the directions of the said Inspector, or offers resistance to, or obstructs the said Inspector, a Justice of the Peace may, upon the complaint of the said Inspector, cause a sufficient number of special constables to be sworn in, and such special constables shall, under the directions of the Inspector, proceed to the premises of such owner or possessor and assist the Inspector to seize all the diseased colonies and infected appurtenances and burn them forthwith, and if necessary the said Inspector or constables may arrest the said owner or possessor and bring him before a Justice of the Peace to be dealt with according to the provisions of the preceding section of this Act.

9. Before proceeding against any person before a Justice of the Peace, the said Inspector shall read over to such person the provisions of this Act or shall cause a copy thereof to be delivered to such person.

10. Every beekeeper or other person who is aware of the existence of foul brood, either in his own apiary or elsewhere, shall immediately notify the President of the Ontario Bee Keepers' Association of the existence of such desease, and in default of so doing shall on summary conviction before a Justice of the Peace be liable to a fine of $5 and costs.

11. Upon receiving the notice in the preceding section mentioned or in any way becoming aware of the existence of foul brood in any locality, the said President shall immediately direct the

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said Inspector to proceed to and inspect the infected premises; but where the person giving such notice is unknown to the President, or there is reason to believe that the information in said notice is untrustworthy, or that the person giving such notice is actuated by improper motives, then the President may require the person giving such notice to deposit the sum of $5 with the President as a guarantee of good faith, before the said notice is acted upon, and if it proves that said notice was properly given, then the said deposit shall be returned to the person giving such notice, but otherwise the said deposit shall be forfeited to the use of the said Ontario Bee Keepers' Association.

12. The said Association shall include in its annual report to the Minister of Agriculture a statement of the Inspector's work during the preceding year, which statement shall include the number of colonies destroyed by order of the Inspector and the localities where found, and the amount paid to him for his services and expenses for the preceding year.

13. The directors of the said Association may from from time to time make such by-laws and regulations for the control and guidance of the Inspector in carrying out the provisions of this Act as they may deem necessary, and the said directors shall also by by-law fix the amount of the remuneration of the said Inspector and Sub-Inspector, but all such by-laws and regulations shall be subject to the approval of the Minister of Agriculture.

AN ACT FOR THE PROTECTION OF BEES.

R.S.O., 1897, Chap. 282.

1. No person in spraying or sprinkling fruit trees, during the period within which such trees are in full bloom, shall use or cause to be used, any mixture containing Paris Green or any other poisonous substance injurious to bees.

2. Any person contravening the provisions of this Act, shall, on summary conviction thereof before a Justice of the Peace, be subject to a penalty of not less than $1, and not more than $5, with or without costs of prosecution, and in case of a fine or a fine and costs being awarded, and of the same not being upon conviction forthwith paid, the Justice may commit the offender to the common gaol, there to be imprisoned for any term not exceeding thirty days, unless the fine and costs are sooner paid.

BY-LAWS OF BEEKEEPERS' ASSOCIATION.

1. This Association shall be known as the Ontario Bee Keepers' Association, and shall be composed of those interested in bee-keeping who become enrolled as members by paying the annual membership fee of one dollar.

2. A general meeting of the members of this Association shall be held once a year, and shall be known as the Annual Meeting, the year to begin with the election of officers at such Annual Meeting and terminate on the election of their successors at the next Annual Meeting. At this Annual Meeting, or at any other general meeting of this Association, ten members in good standing shall constitute a quorum.

3. The time and place of holding the next Annual Meeting shall be fixed by the members present at the Annual Meeting.

4. The Board of Management shall consist of a President, two Vice-Presidents, and nine Directors, elected one from each of the following twelve divisions :

Division No. 1.—Stormont, Dundas, Glengarry, Prescott, and Cornwall.
Division No. 2.—Lanark, Renfrew, Carleton, Russell, and Ottawa.
Division No. 3.—Frontenac, Kingston, Leeds, Grenville, and Brockville.
Division No. 4.—Hastings, Addington, Lennox and Prince Edward.
Division No. 5.—Durham, Northumberland, Peterborough, Victoria, and Haliburton.
Division No. 6.—York, Ontario, Peel, Cardwell, and Toronto.
Division No. 7.—Wellington, Waterloo, Wentworth, Dufferin, Halton, and Hamilton.
Division No. 8.—Lincoln, Niagara, Welland, Haldimand, and Monck.
Division No. 8.—Elgin, Brant, Oxford, and Norfolk.
Division No. 10.—Huron, Bruce, Grey, and Perth.
Division No. 11.—Essex, Kent, Lambton, Middlesex, and London.
Division No. 12.—Algoma, Simcoe, Muskoka, Parry Sound, Nipissing, and Manitoulin.

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Also one Director from the Ontario Agricultural College and Experimental Farm. The Board of Management so elected shall appoint from among themselves, or otherwise, a Secretary and a Treasurer, and shall also appoint at least three of their number as an Executive Committee.

5. Five members of the Board shall constitute a quorum.

6. Vacancies on the Board by death or resignation may be filled by the President, subject to the approval of the Executive Committee.

7. The officers of this Association shall be elected by ballot, with the exception of the Auditor, who may be elected by an open vote of the Association.

8. It shall be the duty of the President to preside at all meetings of this Association ; to call for reports ; to put motions when seconded ; to decide upon questions of order and to declare the result of ballots and elections. The President, in connection with the Secretary, shall have the power to call special meetings when necessary. The President shall be ex-officio chairman of the Board of Directors, and shall call it together when necessary.

9. In the event of the death or absence of the President, the Vice-President shall discharge his duties.

10. It shall be the duty of the Secretary to keep and preserve the books of the Association ; to call the roll and read the minutes at every meeting of the Association ; to conduct all correspondence of the Association ; to receive and transfer all moneys received for fees and otherwise to the Treasurer, having taken a receipt for the same ; to make out a statistical report for the Association and for the Government ; to furnish the officers of the County and District Associations with forms for organization and annual reports, and to give notice of Association and Board meetings through the press or otherwise.

11. It shall be the duty of the Treasurer to furnish such securities for the moneys of the Association as the Board may determine ; to receive from the Secretary all moneys belonging to the Association and to give receipts for the same ; to pay them out on order endorsed by the President and Secretary, and to render a written report of all receipts and disbursements at each Annual Meeting.

12. Any County or District Bee Keepers' Association in the Province of Ontario may become affiliated to this Association on payment of five dollars, which shall be paid to the Secretary on or before the first day of June in each year ; but every local Association so affiliated must have on its membership roll at least five members who are also members of the Ontario Bee Keepers' Association at the time of its affiliation, and must continue to have a like number of its members on the roll of this Association while it remains in affiliation.

13. Every affiliated Association shall receive an annual grant out of the funds of this Association. The amount of such grant shall be fixed by the Board from year to year.

14. All grants to affiliated Associations shall be expended in prizes for honey shows, or for shows of apiarian appliances, or for lectures on subjects pertaining to bee culture, or for advertising district or county meetings, or for any or all of these and for no other purpose.

15. Every affiliated Association shall report to the Secretary of this Association (on a form to be supplied by the Secretary) before the first day of December in each year, which repor shall be signed by the President and Secretary of the affiliated Associations.

16. County or District Associations seeking affiliation should forward to the Secretary an application according to the following form : " We, whose names are written in the accompanying form, having organized ourselves into a County (or District) Association to be known as County (or District) Association No.—, desire to become affiliated to the Ontario Bee Keepers' Association, and we agree to conform to the Constitution and By-Laws of said Association."

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Form of application as follows :

Names of those already Members of O. B. K. A.	P.O. Address	Fees.		Names of those not already Members of O.B.K.A.	P. O. Adkress	Fees.		Remarks.

17. Every affiliated Association that neglects or refuses to pay the annual affiliation fee, or neglects or refuses to forward to the Secretary the annual report on or before the date fixed, may be deprived of their affiliation privileges by the Board.

18. Should an affiliated Association become defunct after the payment to it of the grant from this Associatiou, any unexpended balance of said grant shall be forfeited and paid over to the Treasurer of this Association.

19. Each affiliated Association shall be entitled to the privilege of two representatives at the meetings of this Association in addition to those who are already members of this Associa tion, and such representatives shall be entitled to all the rights and privileges of members of this Association.

20. Every delegate from an affiliated Association shall furnish to this Association a certificate, signed by the President and Secretary of the body which he represents, showing that he has been duly appointed a delegate of such Society.

21. Each affiliated Association shall be entitled to the services of an Association lecturer (when such exists) once in each year, half the expenses connected with such lecture to be borne by the District or County Association and half by this Association.

22. The order of business by which the meetings of this Association shall be governed shall be in the discretion of the President, but subject to appeal to the meeting when objection is taken, when a majority vote of the members present shall decide on the objection, and in such cases the vote of the majority shall be final.

23. These By-laws may be amended by a majority vote of the members present at any Annual Meeting, or at a special meeting of the members called for the purpose of considering the same, and of which at least two weeks' notice shall be given by public advertisement.

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HOW TO EXAMINE APIARIES AND CURE THEM OF FOUL BROOD

BY WM. McEVOY, INSPECTOR OF APIARIES, WOODBURN.

Before opening any colony go from hive to hive and give each colony a little smoke at the entrance of their hive. This will check the bees for a time from coming from other colonies to bother you when you have a hive open and are examining the combs. When you take out a comb to examine it, turn your back to the sun and hold the comb on a slant, so as to let the sun shine on the lower side and bottom of the cells, and there look for the dark scales left from the foul matter that glued itself fast when drying down; for where you find punctured cappings and ropy matter you will find plenty of cells with the dark stain marks of foul brood on the lower side of the cells. Every bee keeper should know the stain mark of foul brood, as it is more important for him to learn to tell it at a glance than to have to use a pin and lift a little of the matter out of a cell by the head of a pin to see if it will stretch three-fourths of an inch. Dead brood of other kinds often have pin hole cappings and several cells in the same combs will be found with scales in them; and for this reason every bee keeper should learn to tell the one class of dead brood from the other, because we often find both classes of dead brood in the same colony with very little foul brood in the same comb, that the keeper did not notice; and after testing the other kinds, and not finding any to stretch we have felt sure that that colony was not diseased when it was, and in time it would get worse, and get robbed out by the bees from other colonies, and then the disease would be spread all through the apiary. I have often been called to come at once by parties feeling sure that their colonies had foul brood, and when I got there I sometimes found that it was not. In some cases I found a very sudden loss of the most of the old bees, and nearly all the brood dead and decaying. This was the result of some foolish people spraying fruit trees while in full bloom, and the bee keeper, not knowing what caused the sudden loss of nearly all the old bees, and finding so much decaying brood, felt sure that his colonies had foul brood. The only sure way for those people that cannot tell foul brood at a glance is to put the head of a pin into the matter in the cells and lift it out, and if it stretches they can depend on it that it is foul brood; but, as I have often said, the most important thing to learn is to know the stain mark of foul brood, and then it never will make much headway in any apiary or cause much loss, because the bee keeper would spot the disease at a glance and head it off at once. Honey to become diseased must first be stored in cells where foul brood matter has been dried down, and it is the bees feeding their larvæ from the honey stored in these diseased cells that spreads foul brood. More brood dies of foul brood at the ages of six, seven, eight and nine days than at any other age.

The disease is spread by bees robbing foul broody colonies, and they carry the disease just in proportion to the amount of diseased honey they convey to their own hives.

Every diseased apiary should be treated according to the exact condition in which it is found, so as to not only drive out the disease, but to make considerable increase in colonies, and end by having every colony in first class condition. In the honey season when the bees are gathering freely, is the only safe time to make increase in a diseased apiary, and I make this increase by tiering up two hives full of the best brood with about a quart of bees until the most of the brood is hatched. By that time I will have a very large swarm of young bees just in the prime of life, and when these bees are all shaken into a single hive and treated I will have a first class colony made out of them. In every apiary that I had treated in the honey season I always had increase made by

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having the best brood tiered up with about a quart of bees, and left until most of the brood was hatched, and then had these bees treated just the same as the old bees that I shook off the brood and treated first.

HOW TO CURE THE APIARIES OF FOUL BROOD.

In the honey season when the bees are gathering freely *remove the combs in the evening* and shake the bees into their own hives; give them frames with comb foundation starters on and let them build comb for four days. The bees will make the starters into comb during the four days, and store the diseased honey in them which they took with them from the old comb. Then, *in the evening of the fourth day*, take out the new combs and give them comb foundation to work out, and then the cure will be complete. By this method of treatment all the diseased honey is removed from the bees before the full sheets of foundation is worked out. Where you find a large quantity of nice brood with only a few cells of foul brood in the most of your colonies, and have shaken the bees off for treatment, fill two hives full with these combs of brood, and then place one hive of brood on the other, and shade this tiered up brood from the sun until the most of it is hatched. Then *in the evening* shake these bees into a single hive and then give them frames with comb foundation starters on and let them build comb for four days. Then, *in the evening of the fourth day*, take out the new comb and give them comb foundation to work out to complete the cure. After the brood is hatched out of the old combs they must be made into wax or burned, and all the new combs made out of the starters during the four days must be burned or made into wax, on account of the diseased honey that would be stored in them.

Where the diseased colonies are weak in bees, put the bees of two, three, or four together, so as to get a good-sized swarm to start the cure with, as it does not pay to spend time fussing with little weak colonies. All the curing or treating of diseased colonies should be done in the evening, so as not to have any robbing done or cause any of the bees from the diseased colonies to mix and go in with the bees of sound colonies. By doing all the work in the evening it gives the bees a chance to settle down very nicely before morning, and then there is no confusion or trouble. When the bees are not gathering honey, any apiary can be cured of foul brood by removing the diseased combs in the evenings and giving the bees frames with comb foundation starters on. Then, also in the evenings feed the bees plenty of sugar syrup, and they will draw out the foundation and store the diseased honey which they took with them from the old combs. In the fourth evening remove the new combs made out of the starters, and give the bees full sheets of comb foundation, and feed plenty of sugar syrup each evening until every colony is in first class order every way. Make the syrup out of granulated sugar, and put one pound of water to every two pounds of sugar, and then bring it to a boil.

Where you find the disease in a few good colonies after all honey gathering is over, do not tinker or fuss with these in any way just then, but carefully leave them alone, until an evening in *October*, and then go to the diseased colonies and take every comb out of these colonies and put six combs of all sealed or capped stores in their place, taken from sound colonies, and on each side of these all-capped combs place a division board. This will put these colonies in first class order for winter with little or no bother at all, and the disease crowded clean out at the same time. But some may say that the disease cannot be driven out so simply in the fall by taking away the diseased combs and giving the bees six combs that are capped all over right down to the bottom of the frames. It can and does cure every time when properly done, and if you will stop to think you will see quite plainly that the bees must keep the diseased honey they took

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out of the old combs until they consume it, as they cannot find any place in all-capped combs to put it, and that will end the disease at once. Many bee keepers will no doubt say that this fall method of treatment will not work in their apiaries at all, because they would not have enough of the all-capped combs to spare from the sound colonies, even if they could find some all-sealed. Very true; but we can very easily secure abundance of all-capped combs by putting miller feeders on your sound colonies in the evenings in September, and feeding these colonies all the sugar syrup you can get them to take; and then in October each of these fed colonies can spare the two outside combs, which will be nicely capped all over right down to the bottom of the frames, and with these all-capped combs you will be provided with plenty of good stores to carry out my fall method of treatment. I finished the curing of my own apiary in the fall of 1875 by this sealed comb treatment, when I had foul brood in my own apiary. All of my methods of treatment are of my own working out, and none of them ever fail when properly carried out.

Empty hives that had foul brood in do not need any disinfecting in any way.

In treating diseased colonies never starve any bees, because it unfits the bees for business and makes them thin, lean and poor, and is also hard on the queens. I never starved any bees, but always tried to see how fat I could make them while treating them by feeding plenty of sugar syrup when the bees were not gathering honey.

If you have nice, white combs that are clean and dry and that never had any brood in them do not destroy one of these, as they are perfectly safe to use on any colony of bees just as they are, and are very valuable to any beekeeper. I have always saved this class of combs for every bee keeper. I once got a bee keeper in the State of Vermont to save over two thousand nice white combs, when he wrote to me for advice, and the saving of this class of combs must have been worth fully three hundred dollars to him. But I have always advised beekeepers to convert into wax all old combs that ever had one cell of foul blood in them, and the only article that will take all the wax out of the old combs is a good wax press; and as these will pay for themselves many times over their cost, I urge the bee keepers everywhere to buy one. Every bee keeper should also obtain the "A. B. C. of Bee Culture," published by the A. I. Root Company, of Medina, Ohio. It is a very valuable book of nearly 500 pages with everything right up to date.

NOTE: Any bee keeper desiring to know whether his bees are affected with foul brood may send by mail, a sample of the diseased comb, enclosed in a pasteboard box, to William McEvoy, Woodburn, Ont. Please see that the sample is free from honey so that other mail matter will not be injured.

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REPORT

OF THE

INSPECTOR OF SAN JOSÉ SCALE

1902.

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO).

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INSTRUCTIONS FOR SPRAYING.

Trees must be thoroughly pruned, and all rough bark and lichen removed.

Have a sufficient supply of material on hand, and a proper pump for applying it.

Do not spray the trees while wet.

Thoroughness in preparation and treating are imperative.

Soap must be used while hot, 2½ pounds to the gallon, and applied very thoroughly after the frosts are over and before the buds open.

Fish oil will emulsify with ½ pound of soap to the gallon of oil, and will take the place of soap.

Crude petroleum (undiluted) should be applied with a very fine Vermorel nozzle, and every part of the tree covered with the least possible quantity of oil.

Crude petroleum (diluted) must be applied with a reliable combination pump and a medium sized nozzle, in the proportions indicated by the size of the air chambers, which must be air tight, and the plungers packed so hard that the pump works stiffly.

Crude petroleum will emulsity with 2½ pounds of soap to the gallon of oil. Use 1 in 5 in winter, and 1 in 10 on foliage. The nozzle should not be too coarse.

Kerosene will emulsify with ½ pound of soap to the gallon of oil, and is recommended only for summer work, 1 in 5 to 1 in 8—say 1 in 6 for apple, pear and plum, and 1 in 7 for peach trees. Apply with a rather coarse nozzle in bright, dry, airy weather.

In preparing emulsion the soap and water must be boiling when added to the oil, agitated violently for five minutes, and the agitation continued slowly while the cold water is being added. Soft water is always best for emulsions.

Lime, Sulphur and Salt. 1 pound lime, ½ pound sulphur, ⅓ pound salt (if salt is used) to the gallon of wash. The sulphur should be pulverised. Slake the lime—which must be fresh—in hot water, add the balance of the material, boil two or three hours, dilute with hot water, and apply hot with a rather coarse nozzle.

Any good force pump is suitable, except for mechanical mixtures. While in use the pumps should be cleaned each night to prevent corroding and clogging of the attachments.

For successful spraying a first-class equipment is necessary. The valves should act promptly and hold all they get. The hose should be heavy enough to give sufficient pressure without danger of bursting, and long enough to allow the operator privilege in reaching every part of the tree.

The extension pipe should be in sections, 15, 30, and 60 inches, joined with couplings. This will give seven convenient lengths, suitable for any work, and when all are in use makes a pipe about nine feet long. Every extension pipe should be provided with a stop cock. The nozzle may have direct, oblique or lateral discharge, according to the work in hand. An oblique discharge may be secured by attaching an ordinary nozzle to a short piece of pipe which had been bent to an angle of 45 degrees, and a lateral discharge by attaching an elbow and nipple to a straight pipe. The advantage of indirect discharge in treating all sides of a limb and every portion of the tree, will be better understood when tried.

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REPORT

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To the Hon. John Dryden, Minister of Agriculture:

SIR,—This year's work in connection with the San José Scale investigation has been so successful that the preparation of the report, which I have the honor of presenting to you, is a pleasant task. In some ways conditions have materially changed, and these I will endeavor to explain.

In addition to the work that has been done regularly, and in compliance with your instructions, extensive experiments were made and these results in reducing the pest, together with those obtained by growers, are so encouraging that the situation appears more hopeful. Space will not permit of giving details of this work, but I will try to indicate the more important features so clearly that there need be no misconception concerning them, dwelling especially upon those that promise to be the most useful.

GENERAL CONDITIONS.

Outside of the infested sections the general condition of the country remains much the same as it was a year ago. Many specimens of all kinds and conditions of scale were received for identification from nearly every section of the Province where fruit is grown, these specimens in most instances having been mistaken for the San José. There were, however, very few specimens of San José from outside points, and I understand from this that growers realize the danger of allowing this pest to become established in their orchards and are watching for it. The great number and variety of samples received furnished an opportunity for the study of Ontario Coccidae, of which I did not fail to take advantage, and by return mail, if possible, sent the applicant the fullest information I could on the subject. This occurred to me to be a good way of giving information where it would be appreciated and acted upon.

But while there is little to report from the country at large, the conditions in those sections where the scale is well established are much the same as they were last winter, except that they are greatly aggravated. All the weak scales perish during the winter; that is, the young ones that are not sufficently advanced and protected, and the more advanced females developing broods. The proportion which escaped depends upon the severity of the winter, but unfortunately there are always a sufficient number of healthy scale remaining to quickly restore the loss. Last winter, being mild, the scale came through with apparently little depreciation. Most people supposed that the cold, backward spring and wet summer would seriously interfere with the usual habits and practices of the scale, but it does not seem to have had much effect beyond holding back the first larvae of the season for probably ten days. The suddenness of their coming, and the countless numbers in which they came, had the appearance of a halt having been called in preparation for a violent assault. The increase from this first brood was apparently no less because of the delay, and the unprecedentedly cold, wet summer which followed did not seriously, if

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at all, interfere with subsequent breeding. The young larvae became very plentiful in the early summer, and during the season the destruction of both trees and fruit was very great indeed. There were many instances of trees dying from the scale in orchards that were previously but slightly infested, and of large quantities of fruit having been discarded because of disfiguration. Dealers have been inconvenienced, and have suffered loss through having infested fruit surreptitiously put upon them, and it will not be so easy to dispose of such in another year. It is conceded by some of the growers that unless they are successful in effectually controlling the scale the fruit from their orchards will, in the future, be of no commercial value, and when once the scale becomes established there is no probability of any orchard in the section escaping infestation. The grower has the alternative of either taking the matter promptly in hand, or of quitting the business. This may seem an unpromising outlook, but it is a good thing to known just what conditions exist. To be forewarned is to be forearmed, and when proper treatment is given the pest will be satisfactorily controlled. In badly infested sections the spreading becomes epidemic, and it is possible neither to dodge the scale nor to get away from it; so the only course left open is to meet it, for like a pestilence the dissemination reaches every part of the district.

The unexpected and quite unprecedented multiplication of the scale in certain localities this year, and the consequent effects, have resulted in a marked change in the attitude of many of the growers living in these sections. In some instances favorite trees have died; in others whole orchards have evidently weakened, and in still others fruit, which was otherwise choice, was not merchantable because of the attack. Evidences of the scale's destructiveness at the present time available is very convincing indeed, for it has asserted itself in a way that admits of no further question, and most of the people who were once slow to comprehend its real character now pronounce it a dangerous pest and declare their intention of endeavoring to accomplish its subjection.

There is, however, a proportion—but principally among those whose interests are small—who regard the scale with indifference and unworthy of their attention, even while the majority of the people are alive to the exigency of the situation. There are those who have made good use of the materials supplied them, having exercised the necessary care, made thorough applications of this material in suitable proportions and secured results so satisfactory to themselves that they will persevere with their favorite treatments, all of which worked well. The testimony of such, their examples, and the results from their work, together with the extreme urgency of the cases, have influenced many more to take up the fight, who, being without experience, are enquiring as to what is really the best treatment to use. I have endeavored as far as has been possible, both by letter and by personal interview, to explain the cost, preparation and behavior of the several treatments recommended; for I feel that now, when aid is being anxiously sought, is an opportune time for extending assistance with a liberal hand—an assistance which, in my judgment, would be heartily appreciated and improved—and in doing this there is much satisfaction in having our useful experiments to refer to as indicating ultimate results. In many instances it is a matter for regret that the owners of infested orchards have not been constrained to commence remedial work earlier, for while they have been revolving in their minds what course to take—if they ever did really make a study of the subject—the scale has gone on multiplying and spreading and fortifying itself by occupying every well protected and advantageous point the trees afford. To allow this condition to be reached is a serious disadvantage for in such a case successful treating is much more difficult than when the trees are but slightly infested.

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Pittsburg Meeting.

At the annual meeting of the Association of Economic Entomologists held in Pittsburg, Penn., on the twenty-seventh and twenty-eighth of June last, which through your kindness, I was permitted to attend, the San Jose Scale question was ventilated in all its phases and excited very great interest indeed. Four lengthy addresses, devoted largely to remedies, were given and fully discussed, which was somewhat of a departure for entomologists, as the subject had been previously considered by them principally from an entomological standpoint.

The meeting was addressed first by Mr. A. F. Burgess, of Columbus, Ohio. Mr. Burgess spoke at considerable length of successful results in Ohio from the use of lime, sulphur and salt in the proportions of 40 lbs. lime, 20 lbs. of sulphur and 15 lbs. of salt in 60 gallons (equal to 50 imperial gallons) of water, cooked two hours, and thoroughly applied Dec. 31st, 1901, to young apple trees ten to twelve feet high and badly encrusted with the scale. On May 24th he was unable to find any living scales except about 10 per cent of the females which had reached maturity. Late in March several owners of orchards had applied the lime, sulphur and salt wash to peach trees with satisfactory results, and in one instance a subsequent treatment with crude petroleum, lightly applied to one side of these trees where considerable of the lime had been washed off by a severe storm of hail and rain, showed no advantage over the balance of the orchard where no oil was used. A single case was reported where peach twigs were apparently injured, but as there were only a few trees so affected, and as the balance of the orchard remained uninjured, it is difficult to understand the cause.

The resin wash was also tried in Ohio, using 20 pounds resin, 5 pounds caustic soda and 2½ pints of fish oil, and after boiling four hours it was diluted with sufficient water to make 100 gallons. The spraying was done on January the eighth, and the results were highly satisfactory. The cost of this wash is less than that of lime and sulphur.

Prof. E. P. Felt, of Albany, N. Y., reported apparently complete destruction of the San José Scale following his spraying operations in December, 1901, in which he used a 20 per cent. mechanical emulsion of light crude petroleum 41.1 per cent. specific gravity, Good's potash whale oil soap No. 3, and Good's tobacco whale oil soap No. 6, on apple, pear, plum, cherry and quince. The apple trees were not materially injured in any case. Duchess pear trees suffered slightly and Clapp's favorite, seriously, from the oil treatment. Plums suffered noticeable harm to the trees from tobacco soap, and noticable diminution of crop from the potash soap. Two small apple trees were painted with linseed oil, raw being used on one and boiled on the other. The first was killed and the second nearly so, which shows the use of linseed oil in the fall is not to be recommended. Many of these trees were encrusted, and, apparently, not a single scale survived the treatment. This statement may need modification as the season advances.

Prof. A. L. Quaintance, College Park., Maryland, reported results from experiments at three points with lime, salt and sulphur only, used in the proportions already mentioned. In one instance part of the treatment was done with a mixture of less strength. Notwithstanding the numerously reported cases of its successful use, Prof. Quaintance is of the opinion that weather conditions are an important factor in the results following its application. These experiments were conducted wholly in the month of March, and included three hundred and fifty apples, plums and peaches, and considerable rain followed the treating at two of these points. In the foregoing tests the results were decidedly disappointing so far as the effectiveness of the wash is concerned, but considered in connection with the weather conditions which prevailed, it is not likely that applications of other insecticides would have given anything like usual results.

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The third test of the wash was with a block of 50 five year old peach trees on the farm of Mr. S. S. Stouffer, Sharpsburg, Maryland. Two formulae were used —the 40-20-15 to 60 gallons water and the 30-12½-8 to 50 gallons (equal to 41⅔ imperial gallons) of water. Very little rain followed this work,and on June 19th live scales were quite hard to find, although some of the trees were badly infested. No appreciable difference was to be noted in the results from the different formulae. The lime, sulphur and salt wash was used by Mr. Stouffer last year on part of his orchards with gratifying results, and the entire orchard was sprayed with it the present spring. Three years ago the scale was very serious in his orchard, some trees having been killed and many seriously injured. At the present time the insect is under complete control and no fear is now felt as to the possibility of keeping it in check with this treatment.

Prof. W. M. Scott, Atlanta, Ga., stated that in Georgia the scale had become established in fifty-seven counties, including the leading orchard sections of the state. No regular system of treatment had been adopted. The gas treatment, although giving good results, has proven too cumbersome, and soap washes, owing perhaps to lack of thorough application, were unsatisfactory. The results from kerosene were generally good, but 20 per cent., either in a mechanical or soap emulsion, was found sufficient. Crude petroleum had largely taken the place of kerosene, and better results were being obtained with it than with corresponding strengths of kerosene, and though on the whole successful, there were cases of injury to treated trees. Differences in weather conditions made no apparent difference in the effect of the oil on either the trees or scale insects. Likewise no appreciable difference in results could be detected between early and late applications. Peach orchards not yet in bearing were more resistive than bearing orchards. Rain within twenty-four hours after soap treatment seriously interfered with the results, particularly when a potash soap was used. At the time of the early examinations where lime, sulphur and salt had been used, a considerable proportion remained alive, but these became fewer as the season advanced. The scaly covering of such insects as appeared to be alive was in many cases so corroded by the wash as to afford little protection, and the strongest solution gave no better results than those of greater dilution. One application of resin wash prepared according to the standard formulae was followed by no good results. Mr. Scott superintended the treating of a very large orchard, and some portions of this were treated four times in one season.

This concluded the papers, and the discussion was opened by Dr. J. B. Smith, of New Jersey, who said that when lime, sulphur and salt wash was first tried at Washington, it was reported by Mr. Marlatt and others to afford little relief, and subsequent tests were attended with the same result. In a second bulletin from the U. S. Department of Agriculture the chemical reactions of the wash was set forth, and it was shown, almost conclusively, that it could not reasonably be expected to be of much value in the moist east. Two years ago a few New Jersey growers tried the wash on badly infested peach orchards, and the results seemed to be very good. During the past season a greater number have used the remedy successfully, and the results from recent experiments in Illinois were remarkably satisfactory. Something like 70,000 or 80,000 trees were treated with this wash in New Jersey. The formula used was almost invariably 50-50-50 in 150 gallons of water, and the preparation was thorough. The majority of the trees were large. Where the work was done on small trees that were not badly infested the results were very good, as a great many trees seemed to have few or no living scales on them. In one orchard, although the season was well advanced, there was only a single tree upon which any larvae were formed, but quite a number on which living females occurred. On trees that were heavily infested the wash had been less effective. It does not penetrate nearly so well

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as oil or soap mixtures, and does not spread at all. The oil is hard on peach trees, and he thought there was no doubt that, particularly on peach orchards, the lime, sulphur and salt wash could be satisfactorily used.

Prof. C. L. Marlatt, Department of Agriculture, Washington, D.C., explained the methods and results from the early experiments, and expressed the opinion that excessive moisture must necessarily interfere with the success of the wash in the east, and that it was on this footing, namely, that if the weather conditions are favourable it will be efficient, but otherwise practically useless. In his experiments the wash was applied almost boiling hot to scale infested trees; but, in his opinion, the heat of the wash does not explain the death of the scales, because, however hot it may be when applied, it is cool a few inches from the nozzle. Mr. Marlatt added that Dr. Forbes' experiments in washing trees heavily with water at various dates after they had been treated had special relation to the subsequent action of washing rains, and they seemed to show that such rains had no effect on the benefit coming from the wash. It was on this account that Dr. Forbes' experiments were of so great importance, and opened the whole subject for renewed investigation, indicating, as they seemed to do, that the wash could be used in regions where rains are frequent as well as in dry climates like that of the Pacific Coast.

Mr. Marlatt then gave an account of his trip through Japan and China, in search of the native home of the San Jose Scale This scale was found in both countries, and while there was evidence of its having been introduced into Japan, this evidence was lacking in China. It is apparently confined to the northern portion, where it is very widely distributed, but is held in subjection by predaceous insects, conspicuous among which a two-spotted lady-bird, very similar in appearance to one common here, which was always present where the scale was plentiful. The larvae of this beetle is a voracious feeder, eating almost continually. Its period of usefulness may extend over a year, and it is not improbable that a single female may be the parent of at least five hundred young. In ovipositing, the beetle selects a suitable scale, drags out the female insect, and either eats or drops it, turns about, and thrusts its ovipositor under the slightly lifted edge of the cover scales, and quickly deposits a single egg. Of the several lots of specimens received at Washington only two individuals survived the winter, one of which was presumably a male. In spite of all these drawbacks, however, these beetles had multiplied to perhaps one thousand by July the first.

In the matter of climate it may be said the region in which it occurred in China and Japan will duplicate nearly enough the eastern United States and California. We have about the same summer and winter temperature, and similar general conditions of rainfall and other climatic features, so that from this point of view there seems to be no reason why the imported lady-bird should not do well.

Nursery Inspection.

During the fall ten nurseries were examined. Only three men were engaged at this work at any time, a large part of the time only two, and at last only one. The completing of the summer experiments, and testing and perfecting our steam boiling plant, made frequent demands upon their time and seriously interrupted the nursery work, which was begun in September and completed within three months. Over half a million trees were critically examined, one by one, and all those found to be infested were promptly destroyed by burning. The condition of the larger nurseries inspected is improved. Some of the nursery men had requested an examination of their stock. Such men are doing their

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utmost to protect their patrons and welcome any assistance. The importance of this work cannot be over estimated, as the scale is not so likely to be scattered widely over the country by any other means as with the tree to which it is fixed. Fruitgrowers appreciate the careful manner in which the work is carried on, and the prompt destruction of infested trees, and speak of it, in conjunction with fumigation, as making them comparatively safe. Inspection of nursery stock is attended to in many of the United States, but not in all, and it is considered to be of such great import to them that they are discussing the feasibility of placing the matter in the hands of the national government.

Municipal Inspection.

The townships of Saltfleet, North Grimsby, and Clinton availed themselves of the privilege conceded by the San Jose Scale Amendment Act of 1902 by appointing local inspectors, who have made an examination of the trees in their respective territory, except that the work in Clinton is not yet fully completed. The utility of this amendment is shown by the result of this inspection, by which the San Jose Scale was located in each of these townships at several points where it was not previously known to be. With the exception of three places, two of which were found late, these infested trees were either treated or taken up and burned, and it has been intimated that the law will be enforced by insisting upon the thorough treating of all infested orchards. This prompt action on the part of the growers in this important fruit district is highly commendable, and now that they know just where the scale has got a foothold among them, it is to be hoped they will succeed in controlling it. This may be done by concerted action closely followed up, especially if commenced promptly. There appears to be very little distribution yet at any point, and now, before this occurs, is the time to act. Delay will seriously increase the difficulty of combatting it; and with such large interests as they have at stake the people in those townships cannot afford to take any chances. In a section like this where fruit is the principal industry, and where there are few breaks to check the progress of the spreading, where the blocks of fruit trees are planted so closely together that orchard after orchard make an almost continuous plantation, the great danger is that some one will be careless, and allow the scale to get an advantage which the combined energy of the district will not be able to overtake.

Material Distributed.

To encourage the use of remedial measures, and to assist those who are so unfortunate as to have the scale in their orchard, spraying material was again distributed in the infested sections, and this year in greater quantity and to a greater number of persons than ever before. Owing to the excellent results obtained from the California wash—lime, sulphur and salt—in our previous experiments, under what had been considered most unfavorable conditions of weather, sulphur was added to the list and the people asked to join us in further experiments. There were 185 bags of 112 pounds placed with 62 growers, 109 large barrels of crude petroleum were delivered to 52 persons, and 123 barrels of whale oil soap to 60 persons. Altogether 133 different individuals were supplied and these have, without exception, paid their proportion of the cost. I have much pleasure in referring to the many kindly expressions of appreciation coming from the people in regard to the liberality of the government in assisting them in their dilemma, and particularly to yourself, in being their constant friend. I have also much pleasure in reporting marked improvement in the use of these remedies. Some at least are giving closer attention to the nature of the work, and

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making a study of treating their trees. As an example of this I will quote a remark that was made by a gentleman in my presence: "Two years ago I sprayed carefully and thoroughly, as I thought, but found I could do better, and last year did do better, but I found that I could do better this year than last, and now I see where I can improve on the work I did this year." I am quite in accord with the foregoing, as it is an explanation of my own experience, and such will be the experience of all who give their mind to the work. The difficulties will disappear, and better results be obtained as year after year we become more familiar with using the remedies.

Whale Oil Soap. The soap used this year was made by David Morton & Sons of Hamilton, and was pronounced by those who have been using soap extensively to be altogether the best the government has supplied. Specimens of infested wood were furnished to Mr. Morton, who pronounced it a difficult case, but declared that if it were possible to make a soap that would destroy the scale he was determined to have the honor of producing it. So far as this soap was applied liberally, and in solution of proper proportions, the results were good, but the great cost stood in the way of enough being used in many instances, and in such the results in killing the scale were disappointing. And again, in treating the San Jose Scale or any other scale, it is imperative that the treatment be so thorough that the scale on every part of the tree will be reached by a sufficient quantity of the spray, which occupies a considerable time in the short season available for this work. As soap cannot be safely used on peach trees before the frosts are over, and a full complement of help being out of the question, it is next to impossible to cover some of the orchards within the time when peach trees may be safely treated with soap. It means in some cases that from fifty to seventy-five acres would have to be sprayed in from two to three weeks, and a due allowance made for unfavorable weather. The brief time in which soap may be applied with safety to the blossom buds of peach trees, and the excessive cost, are the chief objections to the use; but, notwithstanding these, it is the favorite remedy with some who will continue to use it.

Crude Petroleum. The crude petroleum distributed this year came from the Dutton oil fields, which was the source of last year's supply. The extended investigation made two years ago showed this oil to be the most suitable for our purpose the country affords. It is a clean oil of 39 to 39½ degrees specific gravity, and sprays very freely. Before the order was given it was tested again, and continually during its delivery, and found to be quite up to the gravity of that furnished the previous year. Some of the growers complain of the combination pumps not discharging evenly, and have applied the oil undiluted—that is, just as it came from the wells,—using a very fine nozzle, and so far as everything outside of the peach was concerned, have succeeded so well that they now prefer this method. Light applications of pure petroleum gave satisfactory results, but its use in this form is attended with some danger, particularly in the hands of inexperienced persons. Other growers applied the oil in the form of a mechanical emulsion with water, using the combination pump, and claim that in this way if 20 per cent. of oil be used, five times the quantity of spray will contain the same amount of oil as when pure, and that, as this diluted mixture may be applied in larger quanity without endangering the tree, less time would be consumed in covering it, and the larger amount of spray would tend to secure more complete treatment than is likely to result from applying undiluted oil in small quantity, especially if the trees are large. An emulsion of crude petroleum prepared with soap was also used by a few who speak well of it, as they find the treatment is not so trying to tender trees as when no soap is used. In this way crude oil may be diluted to almost any proportion with water and applied with an ordinary pump. The result from

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the use of crude petroleum by the growers was generally satisfactory, but it is regarded as an unsafe treatment for peach treas. The only adverse result complained of from its use on apples, pears and the harder varieties of plums is that its resistant quality has the effect of driving the young larvæ out onto the new growth and, unfortunately, also the fruit. Many of those who used oil had not tried it before, and sprayed only parts of their orchards. As the season advanced the comparison was so much in favor of the treating that they will not hesitate again.

Lime, Sulphur and Salt. When it was announced in 1901 that lime, sulphur and salt—the wash so popular in California for combatting the San Jose Scale—had been found effective here, it was regarded by many as the long looked for panacea, and sulphur was accordingly distributed in large quantities as already stated. There was no particular difficulty with the pumps in applying the wash, but the cooking of the sulphur with the lime which is necessary to bring them to a proper condition, when nothing better than the cooking appliances in common use among farmers were available, was found to be a serious matter and not feasible when many trees were to be treated. In some instances where large orchards were involved a couple of fifty-gallon kettles were employed, and in two cases which came to my notice special boiling plants were prepared by placing large sheet-iron trays or pans in an arch. This latter arrangement is more economical of fuel than an open fire, and cooked the material about as rapidly as one pump would apply it. The mysteries of preparation not being generally understood, there were many disappointing experiences, especially among those who undertook the treatment in a small way. The difficulty of applying warm was augmented by windy, showery, and on the whole adverse conditions of weather for spraying, which was somewhat discouraging. Greater determination was behind the better preparation, and such men persevered until they had made themselves familiar with bringing the mixture to a condition suitable for use.

So far as we have heard the effect of this treatment was approved by all who tried it, both as an insecticide and in cleaning up the trees. There were no injurious effects apparent, leaf curl was controlled, and in all cases bearing peach trees were heavily laden with fruit. Several large blocks were treated with results satisfactory to the owners. One lightly infested block of several hundred trees was so completely covered with the spray that it was greatly admired by passengers on passing trains, and brought about many interesting remarks. No live scale has been found in this orchard since the treatment, either during the summer or at the time of harvesting the crop, which was the only really good crop the orchard ever bore.

Those who used lime and sulphur this year will use it again, and a great many more who have come to regard it as the one safe remedy on which they may rely to destroy the scale without endangering the trees.

Fumigation by the People.

Fumigation with hydrocyanic acid gas was used successfully by several fruitgrowers. In one instance a block of four hundred four-year-old pears was treated in this way, box tents being used and a considerable number of full-grown pear trees covered with large sheet tents operated from a derrick on a wagon. Fumigation may be done most conveniently before growth starts but owing to the pressure of other spring work this was not commenced until the buds were bursting. It was soon found that ½-gram exposed forty minutes burned the young leaves, and the work was continued at night without further loss except during one night when some of the foliage was scorched, the cause

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for which cannot be explained. One dose of $\frac{2}{5}$-gram exposed twenty minutes did the leaves no harm, but $\frac{1}{2}$-gram was generally used with an exposure of thirty-five to forty minutes and the results are very satisfactory, as no live scale have since been seen on these trees.

At the request of a committee appointed by the Niagara Peninsula Fruit Growers' Association—and to assist those whose small holdings in cities and towns were infested with the scale, and whose interests were not sufficient to warrant an expenditure sufficient to provide themselves with a suitable outfit and material, many of them having only town lots—five pumps were placed in charge of suitable men who attended to the treating of about fifty such places, but were unable to serve all who made application. Whale oil soap, crude petroleum, petroleum and soap, and lime, sulphur, and salt, were used, according to the wishes of the owners of the properties, who paid the entire cost of the labor and one-half the cost of the material. The practicability of this plan for such conditions was fully demonstrated. It worked very well indeed, and might be practiced with advantage throughout the country if experienced men would furnish material, engage assistants, and undertake the work at a price per tree or per acre. This way of getting spraying done is popular with a great many people. Prof. Webster, now of Illinois, holds that this is the only way spraying will be done as it should be, and there seems to be no good reason why the men who do the threshing for a neighborhood in the fall should not do the spraying during the winter and spring, particularly if lime and sulphur be used and the boiling be done by steam. It would make employment both for them and their machinery at a season of the year when the machinery is not now required, and spraying is certainly less objectionable work than threshing. Many people imagine they do not properly understand making and applying the remedies, and withal are not provided with a good spray pump, and so have not confidence in their own work, but are willing to pay for proper service. Fit men, giving themselves up the work, would secure the very best pumps and nozzles, and would soon become experts at the business, and confer a benefit on a community which would be both generally appreciated and profitable to themselves.

Experiments.

Much more elaborate experiments were conducted this year than had previously been carried on in connection with this work to determine which of the several remedies that are recommended for combatting the scale are really the most useful and have the most points in their favor. It is somewhat difficult to find such conditions as are most suitable for successful experimental work, and these cannot always be obtained, a medium-sized orchard of infested trees of various kinds, well removed from the danger of reinfestation, being desirable.

The scale was generally distributed through the blocks that we treated. Many of the trees were heavily encrusted, wholly or in part, and unfortunately most of them stand either in or adjacent to orchards that are infested. Over 1,300 trees were used in these experiments, none of which were treated a second time, except five plum trees that had been sprayed with a strong potash solution, which had so little effect in killing the scale that the trees were subsequently fumigated to save the adjoining rows from becoming reinfested.

The conditions under which we were placed were of course much more diversified than those with which any resident orchardist would have to contend, and the restrictions of time and expense made it seem necessary to push the work on whenever it was at all possible, rather than discontinue operations temporarily, when it was unlikely that the best results would be obtained because of unfavorable weather During the greater part of March the weather was ideal, but we had planned to do the bulk of the experiments in April, and during the first

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half of the month storms prevailed to such an extent that progress was necessarily slow, and the work could not always be done satisfactorily.

As in such work there is always much that is disappointing, we will not attempt to give full details of these trials, but prefer to devote the space to methods of application, general conditions and the ultimate results from such remedies as are most promising, referring briefly to others.

In these tests gas and spray remedies as follows were used: Whale oil soap, fish oil diluted and as a soap emulsion, with and without potash, crude petroleum diluted with water, soap and crude oil in various proportions applied mechanically and in the form of a soap emulsion, potash solution, lime and sulphur with zinc, and with and without salt, kerosene diluted with water, and in a soap emulsion and fumigation with hydrocyanic acid gas.

Whale Oil Soap.

Whale oil soap being the oldest remedy for the scale, is so well understood by the people that it was used on this occasion merely for the purpose of comparison. The soap was used in the proportion of 2½ pounds to the gallon of water, applied thoroughly while warm, to pear and plum on April fifth, and on April nineteenth to peach, with the result that at the July examination only a few scales were found alive, and at the end of the season the infestation was much reduced Trees that were badly infested before the treatment are still considerably affected, as is almost invariably the case with incrustation, and the heavier it is the greater the difficulty in getting good results from treating. There was a strong growth of wood on these trees, the foliage was very fine, and notwithstanding the danger of using potash in large proportion, a good crop of fruit was harvested.

Fish Oil Emulsion.

The difficulty of obtaining whale oil soap and the uncertainty as to what it contains, together with the impression that saponification has the effect of neutralizing the elements of soap to some extent, suggested the idea of bringing the oil and potash together without the influence of heat by emulsifying, and thus preserving their full force as well as being certain of what constituted the emulsion and saving the cost of producing soap. It was found that fish oil will emulsify readily with the same quantity of soap as is required for kerosene (½ pound to gallon), and an emulsion was prepared from 5 quarts of fish oil and 2½ pounds of potash in ten gallons of emulsion, which was estimated to contain fish oil and potash in the same proportions as would be in 10 gallons of soap wash at full strength. The preparation is very simple, and really easier than dissolving whale oil soap in large quantity. It sprays freely, covers the tree very perfectly, and goes a long way. It was used throughout the month of April on pears, plums and peaches without harm to the trees, and the effect in killing the scale was quite equal to soap. There were also good results from applications of reduced strength, and the insecticidal qualities did not appear to be impaired by withholding the potash and substituting a simple emulsion of fish oil. A solution of three pounds of caustic potash in ten gallons was applied to five plums on April seventh, and the effect in killing the scale was so trifling that these trees were fumigated July seventeenth to prevent the adjoining trees becoming reinfested, and this was the only instance in the whole list of our experiments of a second treatment being given. It would appear from this that potash has little or no effect on the scale, and that it is the oil in soap that does the work. Fish oil, with and without potash, was applied mechanically with like results. Fish oil is so thick and heavy and evaporates so slowly that it cannot even be considered in relation to summer treatment. A strength away below what would be fatal to the scale will entirely defoliate the trees.

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Crude Petroleum Experiments.

Crude petroleum is very widely used as a remedy for the scale, and has proven satisfactory in treating the more resistive varieties of fruit trees. At the same time much injury has resulted from excessive applications to tender sorts, and it was with the hope of determining in what ways it could be most advantagously used and to what limit, that these experiments were undertaken.

Owing to disastrous results from the use of undiluted crude oil last year on peach, it was not included in our tests, but as a diluted mixture in proportions from 20 per cent. to 25 per cent. applied March twenty-sixth to April seventh, it proved very satisfactory on apple, pear and plum. Oil will kill all the scale and other insects it reaches in sufficient quantity, and its adhesive and diffusive qualities enables a careful operator to cover the twigs perfectly in little time. We think large trees may be covered more easily with oil than with the other remedies. No preparation of spraying material is required, and with the emulsion pump in proper form the work may be proceeded with rapidly. In making these treatments the object we had in mind was to cover every part of the tree with just enough oil to kill the scale. The results upon the whole were very good. So far as we could tell neither trees or fruit buds were injured. Many of the treated trees had been incrusted, and now the degree of infestation is much reduced. The larvæ do not fix successfully on the oil where enough of it remains, but we think this has a tendency to drive them out on to the young growth and the fruit.

The Combination Pump.

There has been some complaint of the behavior of the pump, but this is due to misconception of its requirements. No combination pump without adjustable air chambers will give other than one percentage of oil and water, and give it continuously. This percentage is indicated by the relative size of the air chambers. When the stroke of the pump handle is being recovered it is the pressure in the air chamber that gives the result at the nozzle, and for absolutely even and perfect delivery of accurate proportions the quantities of oil and water pumped must be in exact accord with the capacity of the respective air chambers. For example, if the air chambers be of equal size the only proportions that could be positively relied upon would be equal parts of oil and water. If the air chamber of the water pump be seven times as large as that of the oil pump the only proportion obtainable with certainty would be $\frac{1}{8}$ or $12\frac{1}{2}$ per cent. of oil, and if the air chamber of the water pump has four times the capacity of that of the oil pump, 1-5 or 20 per cent. of oil would be the only percentage of which we could be really sure. Most of the pumps as sent out are calculated for about this percentage, which is the best for general use. The quantities pumped must be accurate, otherwise the pressure in the air chambers will not be evenly maintained, and that is imperative. To obviate slips in the pumping the plungers should be packed so hard that they will work stiffly, and the air chambers must, of course, be perfectly air-tight which is not always the case, and leaks are likely to occur from its being disturbed by removing the cap, etc. Should the cap be at any time removed red lead should be used in replacing it and much care exercised because of the difficulty of confining air. Whether the percentage of oil is too much or too little can be readily ascertained from the indications at the nozzle while the stroke of the handle is being recovered. Our method of determining the accuracy of the pump is to bring the pressure to all the hose will withstand; then discontinue the pumping, and allow the pressure to entirely exhaust itself; then resume the pumping and if, when the pressure has been fully restored, there has not been at any time any change observed in the color of the spray coming from the nozzle, which has been continually in operation the pump is ready for work.

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Crude Oil and Soap Applied Mechanically.

Crude petroleum with soap was tried in the proportions of 25 per cent. of oil with ¾ pound and ½ pound of soap and 20 per cent. of oil with ¼ pound of soap to the gallon of water, by adding soap in these proportions to the water in a combination pump. One treatment was given on the 5th of April to pears and plums, and another on the 25th to peaches. The opinion has been expressed that soap in combination with oil has the effect of making oil treatment more trying, by holding it longer in contact with the trees and thus preventing evaporation. So far as we have experience our observation is that this is correct in regard to the effect on foliage; but soap is a much milder treatment than crude oil, and the fish oil, combining with the mineral oil, materially lessens the danger of injury to the trees. There was no injury whatever done to the trees except a material diminution of the peach crops as shown by comparison with those that were lime and sulphur treated in adjacent rows. The foliage was luxuriant and very dark in color. The plums were badly infested, and a few of the peaches, besides a general distribution of scale throughout the block. The insecticidal effect of the treatment was very good so far as the peaches are concerned, the infestation being much reduced even on those that were most affected. The heavily encrusted plum trees show less advantage. Lice were quite plentiful in July but, owing to the presence of the oil, have not re-occupied the trees as they would otherwise have done.

Crude Oil Emulsion.

Several attempts were made to produce an emulsion of crude oil, before one that was really permanent was finally got by using five times as much soap as is required for kerosene. With care in making this emulsion the petroleum remained well distributed, and made it feasible to use a percentage of crude oil with water when no special pump is available, which is what we were trying to do. On denuded trees we used 2 gallons of oil and 5 pounds of soap in 10 gallons of emulsion, or, in other words, 20 per cent. of oil and ½ pound of soap to the gallon. This was applied to plums and peaches during the last week in April, not only by ourselves but also by Mr. Thomas Archibald, of St. Catharines, who used it on one thousand trees and speaks well of it. We used this treatment on two orchards, one of which showed little injury to the fruit buds, and the other noticeably more. The effect in killing the scale corresponds very closely with that obtained from the mechanical application. This emulsion sprays well and little difficulty was experienced in regard to separation. We think it is clearly demonstrated that by this means a very light percentage of crude petroleum may be successfully applied with an ordinary pump.

As a summer treatment crude oil emulsion was used at eighteen places in different sections, on infested pear, plum, cherry, peach, and on raspberry badly infested with white rose scale. In all mixtures 2½ pounds of soap to each gallon of oil was used, which were applied in proportions varying from 1 gallon of oil in 5 gallons of emulsion, to 1 in 20. When the heavier proportions were used much loss of foliage occurred, especially to peaches and Japan plums. In one or two instances the loss would probably amount to fifty per cent., but mostly about thirty per cent., while other varieties suffered considerably less. This material was used mostly at 1 in 8 to 1 in 10, and these lighter strengths were correspondingly less injurious to the foliage. Our judgment is that too much attention may be given to preserving the foliage, for when a tree becomes badly affected in the summer, it is preferable to destroy the scale, even at the expense of a portion of the leaves. The result of this summer treating with crude petroleum emulsion is, on the whole, very satisfactory. While there is altogether too

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much live scale remaining on many of the trees that were treated, there are also incrusted trees that were sprayed in the cour e of the summer on which we are unable to find any live scale. The only explanation we have for this is that the results indicate the thoroughness of the treating, and such results will invariably follow; as the treating nears perfection so will the results. Crude petroleum is a very fine remedy where it may be safely applied in sufficient quantity. Crude oil, applied while the insects are breeding, will remain fresh and seriously inconvenience them throughout the season.

Lime, Sulphur and Salt.

The California wash, which was so satisfactory last year in a single test, was given a more extended trial, beginning on December the first and continuing to May the first as a winter treatment, and to August the eighth on the foliage. Acting under advice, more lime and sulphur were used than seemed to be required in the drier California climate. Salt was dropped in some instances, as it had been spoken of as affording no advantage, and sulphate of zinc was added in others with the view of making the wash more adhesive and permanent. Pears, plums and peaches were included in these experiments. Both gray and white lime were used and the water was invariably brought to a boil before any of the material was added. The cooking was done in kettles over a fire, and continued two or more hours. In all cases the quantities hereinafter named are for 30 gallons of wash. The lightest proportions used were 15 pounds of lime, 9 pounds of sulphur and 9 pounds of salt, which would be considered a light wash in California; and the heaviest proportions were 60-20-15 which did not inconvenience the pump and left no sediment in the barrel, besides which there were many intermediate strengths. So far as we have information the proportions in most common use in California are ½ pound to ¾ pound lime with half the quantity of sulphur and one-third of salt to the Imperial gallon (equal to 1 1-5 American gallons) of wash. This experimental work was commenced before the completion of our last report, and the reference to it made there is fully verified. The lighter proportions were less effective than when more material was used, the heavier proportions are less desirable than those of medium strength (those found most useful were 30 pounds lime, 15 pounds sulphur and 10 pounds salt) and the results obtained from treatments made during April and the latter part of March are better than those from treatments during the winter. It was equally effective in destroying all scale insects against which it was used.

In applying this wash we found a bent pipe and a rather coarse nozzle desirable. Indirect discharge assists greatly in making the treatment perfect, and if the material had been sufficiently cooked, stirred well, and strained into the pump, there was no difficulty from the clogging of the nozzle. We notice, however that the twigs were not so quickly covered as with oil, and that somewhat more material was consumed in treating a tree. The nozzle should be held at a sufficient distance to allow the material to break into a spray, otherwise it will splash off. We have never obtained such perfect results as with treating done with California wash 30-15-10 in April of the present year on bearing peach trees, and the results were really the best where no salt was used. Some of these trees had heavily encrusted parts and at the examination in July no larvæ were found on them. So exceedingly satisfactory are the results in this block that the commission, detailed at the close of the season to make an examination and report, pronounced the work surprisingly good. It was a block of badly infested trees, much exposed to re-attack, but the few live scale remaining, not being so protected by encrustation as were their progenitors last winter, it looks as though a similar treatment next spring would clean it up. We think it is clearly shown that a grower can protect his orchards regardless of surrounding conditions.

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White lime appeared to slack finer than gray, and worked rather better in the pumps, and we thought the gray slightly more durable on the trees, but we observed no advantage from the zinc. California wash has some excellent qualities peculiar to itself. In spraying trees affected with San Jose Scale the all-important object is to make the treatment so complete that no part of the tree will escape. The quality this wash has of whitening as it dries discloses parts that have been missed, and by retouching these we think a much more perfect covering may be got than with any other remedy. Any influence the wash may have in retarding the opening of the fruit buds will be beneficial, and the fungicidal effect in suppressing leaf curl and relieving the tree of parasitic growth is, we think, greater than was at first supposed. The effect upon the scale is also peculiar. In the cases of encrustation which generally occurs where the trees are at all badly infested, a proportion of the females are so protected by the layers of scales that the wash does not reach them, for it neither penetrates nor distributes to any considerable extent and all females so situated will not be affected by it. But if the application be thorough, the males being scattered over the surface and exposed, will all be killed, and the possibility of the females being fertilized will be entirely cut off. In the first examination these living females were found, and the case not being understood the wash was condemned, but when breeding began there were no larvæ on treated trees, and the microscope showed that these mature scales were not developing young, while females on untreated trees were packed full of them. The fertilized females attained to a larger size, and lived to a greater age than the others, but gradually shrank and died, as had those which had given birth to a brood. The weather which followed the spraying with lime, sulphur and salt in April was such as is likely to occur at that season. During the first ten days there were four fine days, four days that were showery and two heavy rains the first of which came the first day after the treating, and the second on the eighth day. California wash is cheap, costing when ready for use from one to one and one-half cents per gallon, it is apparently more effective than any other liquid treatment, it is entirely safe to apply to any species of fruit trees when dormant, and for this reason is peculiarly suitable for mixed orchards. It is easily applied. A perfect covering is likely to be obtained, and with the aid of steam in cooking, the finished material can be furnished very rapidly.

Boiling by Steam.

The only difficulty complained of in regard to treatment with California wash was the cooking, and the consequent delay and expense in preparing it. Where large quantities were required, boiling over a fire seemed too slow, and lately we have used steam from threshing engines so successfully that the finished material in good form was supplied as rapidly as it is likely to be required under any conditions and with a greatly reduced expenditure of fuel. A row of twelve barrels are placed on a slightly elevated platform to facilitate drawing off the material when sufficiently cooked. The steam is conducted through an inch lead and down into each barrel through a one-quarter inch pipe furnished with a stop-cock, making each barrel entirely independent of the rest. Cold water is conducted in the same way.

The barrels are filled one-quarter full with cold water and four of them brought to a boil, which, with steam at from eighty to a hundred pounds pressure, will occupy about five minutes. We then turn steam on to a second four barrels and off the first, into which the lime and sulphur are introduced as rapidly as is possible without boiling over. When the lime is all slacked the steam is returned, and a small stream of cold water turned on sufficient to fill the barrel in the course of the two hours' boiling necessary to fully reduce the sulphur, which

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condition will be shown by its taking on a dark amber color. There is no danger of burning, but we found it desirable to stir the mixture, particularly at the beginning of the cooking and before removing to the pump. The method is entirely practicable, and we see no reason why the men who are threshing for a community in the fall should not find it profitable to employ their machinery and their time in doing the spraying in the winter and spring.

Fumigation Appliances.

A large number of tests with hydrocyanic acid gas at different strength were made from early in September, 1901, to late in July 1902, with the view of definitely determining its effect throughout the year, both on the tree and on the scale, and particularly during low temperatures following a prolonged cold dip, when the insect would be most dormant, in comparison with the effect in warm summer weather when it would be active. Throughout the whole of this work, nothing occurred which reflected adversely upon the efficiency of the gas treatment when used under normal conditions. Bearing plum trees fumigated in September, 1901, with ¼ gram exposed forty-five minutes (the strength and exposure ordinarily used for dormant nursery stock) leafed out in the spring several days later than others in the same block which had been sprayed with crude oil about the same time. Trees that during very cold weather were subjected to 1-4, 1-3, 2-5, 1-2 gram with full exposure, were not affected injuriously by these heavy strengths of gas, and living scales were not subsequently found on any of these trees, except where ¼ gram had been used. As time went on many trials of lesser strengths were made and the results were uniformly good. Even as low as 1-7 gram exposed twenty minutes and 1-10 gram, exposed thirty minutes were used July 18th, from 4.20 to 5.45 p. m., without injury to the foliage and with apparently perfect results in killing the scale. It is important to destroy the last one so that none may remain to reinfest the tree, and fumigation will, in my judgment, reach that last scale. These trees were examined repeatedly, but no living scales were found on them until September 26th, by which time they had evidently become reinfested from nearby infested trees. Gas affords no relief from reattack, and this work is so unfavorably situated on this regard that many of the fumigated trees have, to some extent, become reinfested. All this goes to show that gas is a perfect treatment for the San Jose Scale; that it may be used successfully at any time of the year, if used of sufficient strength; that the strength ordinarily used for nursery stock and which is entirely successful at the season when this work is done, cannot be relied upon for very low temperatures, and that less than half this strength is effective in July. In short, that the scale is much more susceptible to gas treatment when it is active than when dormant, and the more active it is, the more susceptible. We think this may be said correctly of any treatment.

Kerosene Emulsion.

The dormant or quiescent period in which the trees without leaves had been thought to be the only time of the year when the scale could be successfully treated with sprays. But there were so many instances of serious injury, which in some cases amounted to absolute ruin to the trees and fruit during the summer and fall, through the scale becomes plentiful at this season, that it became necessary to find a remedy that would destroy insect life without impairing the vigor of the foliage and very tender growth. Besides fish oil and crude petroleum, the effects of which have already been explained, kerosene, benzoin and lime and sulphur at one-third strength were used. The latter mixture told severely on the foliage, but only temporarily on the scale. Benzine, being extremely

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volatile, possibly escaped before it reached the trees, for there was really no effect whatever. Kerosene which two years ago was so disastrous in our winter work, in consequence of which we were slow in taking it up, proved correspondingly useful as a summer spray in saving the fruit from infestation and destroying the scale on badly infested trees without injuriously affecting the foliage. The results from it were somewhat variable, however, and seemed to depend to a considerable extent on weather conditions. It evaporates rapidly, and quickly loses its virtues by standing. One lot left standing several weeks and then applied had no effect in killing the scale. Proper applications made on warm, bright, airy days, and particularly if it were really hot and dry, were invariably successful. We used the kerosene both diluted mechanically and in the form of a soap emulsion, and prefer the latter. The proportions which were most useful were 1 in 6 for hardy trees and 1 in 7 for peach and plants of that class that is, one gallon of kerosene in a total quantity of seven gallons of emulsion. Some of the partial failures in our work were evidently due to using a nozzle so fine that the spray loaded the foliage and did not reach the branches very well in all cases, a condition which in this work we aim to avoid, and was finally obviated by using a rather coarse spray which splashes off the leaves and forces its way through them to the wood. We have a beautiful example of the efficiency of this remedy, in a block of seventy-five infested Japan plums which were treated with 1 in 7 on September the tenth while the foliage was yet plentiful. Very few of the leaves come off and the trees are practically freed from the pest.

White Rose Scale.

During the early part of the season specimens of raspberry canes infested with a white scale, resembling Scurfy Bark Louse in appearance, on the wood, were received from different points. Upon examination these proved to be White Rose Scale (*Diaspus Rosae*) frequently found on rose bushes, which had become so plentiful on the raspberry plantations that the vigor of the canes was noticeably affected. Examinations were commenced on April the 29th, and continued throughout the season. The insect lays eggs, is multi-brooded, and is present at all times of the year in all conditions except such as are not possible in winter. It spread rapidly towards the close of the season and became plentiful on the young canes, but there was very little spreading to the young wood until a considerable time after the fruit was harvested. It is good practice in any case to take out the old wood at harvest, and had this been done it would seem that the young growth would largely escape being infested. Spraying with any suitable oily or caustic wash, and particularly with lime and sulphur late in the winter, will in all probability cause the destruction of this insect.

Spraying Demonstrations.

At the request of the growers, demonstrations in spraying were conducted at Grimsby, St. Catharines and St David's from the 15th to the 17th of April, at which diluted crude oil, fish oil emulsion, and lime and sulphur were applied to the trees, the two latter being prepared in the orchard. The object of these meetings was to afford the people an opportunity of becoming acquainted with our improved pump fittings, the preparation and application of the remedies, and the ultimate results which could be observed throughout the season. The weather was ideal all the way through, and the attendance large, especially at Grimsby and St. Davids. Evening meetings were also held, which were addressed by prominent fruitgrowers who discussed a variety of fruit subjects, but particularly the San Jose Scale, asking many questions, which, to the best of my

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ability, I endeavored to answer satisfactorily. Much interest was shown by those present both in the field and at the evening meetings, and the opinion seemed to prevail that the time had been profitably spent. A similar meeting was held at Ancaster on May the 14th, at which a different set of formulas was used.

Our method of boiling lime and sulphur by steam was exhibited November 19th at St. Catharines; November 29th at Niagara, and December 5th at Winona. These meetings had been extensively advertised by the Department of Agriculture at Toronto, and the 19th being a very fine day, the attendance at St. Catharines was about one hundred, some of whom came from distant points, Mr. G. C. Creelman, Superintendent of Farmers' Institutes, being among the number. The meeting at Niagara could not be held until the day after that advertised because of a snow storm, and in consequence the attendance was smaller; but at Winona, notwithstanding a very high wind and ten degrees of frost, the attendance was about equal to that of the St. Catharines meeting, and many of those who came manifested their interest by remaining until night. The plant worked satisfactorily on all occasions, and highly complimentary remarks were made by both visitors and the press. The mixture was applied at all of these points, and nearly as much interest shown in the spraying as in the preparation of the material. I am greatly pleased to have this work done, as it will determine the effect of such treating at a season with which we have no previous experience. The idea of this field work was suggested by Mr W. H. Bunting, of St. Catharines, and after what we have seen we heartily concur in it as being a most excellent plan for conveying a proper conception of the work in all its details. No other way will serve the purpose so well as being present and seeing it in progress.

The relation of San Jose Scale to fruitgrowing is much the same wherever it exists. The methods used in controlling it and the results obtained are so similar in many sections, that to exemplify this I take pleasure in giving my own views in the words of Prof. A. L. Quaintance of Maryland: "The necessity of treating trees infested with scale need hardly be repeated here, for it should be generally known by this time that to neglect such work inevitably means the death of the trees. If your orchards are infested with scale you have the alternative of taking the matter in hand or sooner or later to give up fruitgrowing. Abundant experience in many of the Eastern States has shown that the scale may be satisfactorily controlled by the employment of partial remedial measures, but it should be distinctly understood that the work must be thorough, and followed up from year to year. Where the scale has become established there is little likelihood of its ever being entirely eradicated unless in very exceptional cases. Consequently, efforts should be expended towards keeping it reduced below an injurious quantity. In a word, we must come to realize that the San Jose Scale is with us to stay, and where established provision must be made for keeping it in subjection as a part of the routine orchard work. As to whether or not it will pay to grow fruit with the added expense of fighting the scale must be, from the nature of the case, an individual question. If a grower is convinced that there is no money to be made in fruit culture with this added expense, he should lose no time in putting his land in other crops, and not allow the orchard to gradually die from the effects of the scale, and prove a source of infestation for the surrounding country. There will be many however, who will find it profitable to grow fruit under the adverse conditions mentioned, and this effect of the scale will undoubtedly tend towards a specialization of the fruit industry. Orchards will be given more undivided attention, insuring better cultivation, pruning, spraying and the handling and marketing of fruit than has, as a rule, heretofore been given. Under these conditions the growing of fruit

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will continue to be highly profitable, and in the writer's opinion there is a most hopeful outlook for fruitgrowing in the future if followed along these lines. There are some who affirm that this pest, in its ultimate effects, will prove to be a blessing, as it will tend more and more to make fruit growing a definite business. Be that as it may, many small home orchards will doubtless be abandoned, and the loss of fruit to the many who grow it largely for family use will be a considerable hardship. It by no means follows that the small home orchard need necessarily be abandoned; but as a rule, I have experienced considerable difficulty in inducing the general farmer to adopt the necessary measures to protect the comparatively few trees which he has growing to furnish fruit for his family use."

A heavy correspondence has passed in connection with this work which is both interesting and corroborative.

Dr. L. O. Howard, Washington, D.C., says in one of his letters: "Lime, sulphur and salt has been used continuously on orchards in California for ten or fifteen years with best results. There is positively no danger in using the wash year after year. The kerosene emulsion is also used extensively in Georgia, and is reported to be quite as efficient as the oil-water sprays, or the lime, sulphur and salt wash. This is coming back to old principles, kerosene emulsion having been the standard remedy for many years."

Prof. L. R. Taft, Michigan, recommends lime, sulphur and salt in the winter, and lime and sulphur in the spring. Has used kerosene, both diluted and as a soap emulsion, with good results.

Prof. A. L. Quaintance, Maryland, in a letter just to hand, explained that he has had "better satisfaction from lime, sulphur and salt in treating all classes of dormant fruit trees in the spring for the San Jose Scale than any other substance used. Of summer washes 20 per cent kerosene soap emulsion has proven the most satisfactory of the numerous substances tried." He thinks it is only a matter of time until the lime, sulphur and salt wash or the Oregon wash will be the main reliance in his State for the control of the scale.

Prof. J. B. Smith, New Jersey, says: "There is no doubt that lime, sulphur and salt is a satisfactory treatment, particularly on peach orchards."

Prof. S. A. Forbes, Illinois: In Dr. Forbes' experiments, in addition to the rainfall, some trees treated with lime, sulphur and salt were heavily and repeatedly sprayed with water, and, in comparison with trees carefully protected with canvas coverings, showed no difference in the ultimate results. The early wettings delayed the insecticidal effect, but this was practically complete in every instance before May the 12th. It is entirely harmless and may be used freely on all kinds of trees, shrubs and vines. Dr. Forbes used gas, soap, oil and lime, salt and sulphur, all of which he designates as good insecticides under favorable conditions, but the best method and material for common use against the San Jose Scale is spraying in winter with the California wash.

Mr. S. A. Pease, San Bernardino, Cal., the veteran scale inspector, writes as follows on November 23rd, 1902: "I have heard the same story of injuring or killing trees here from persons who were not authority on the subject, but were prompted probably by the fact that they did not want to do anything for their trees. I have used lime, sulphur and salt every year, when needed, for many years and never saw any injurious effects whatever; but, on the other hand, if it was boiled until the sulphur went into solution, which usually takes three hours or even more, always with satisfactory effect. I have seen the scale practically exterminated with one spraying. Our method is to go over the orchard once, and then go over it again as the trees whiten, and patch where any trees do not show white, thus leaving no scale that are not covered by the wash. If the wash is not boiled until the sulphur goes into solution it will not do a parti-

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cle of good. This is my experience, and it is where we have had trouble here as many used to show a disposition to save fuel. The sulphur is the very last to go into solution. Some have said it would not, but this is not the case. I must say right here that it is not safe to spray when the trees are in bloom or the buds much swelled, as it will kill the fruit at such a time. We always spray here when the trees are dormant, and the leaves off. You will readily see that at such times it is easier to cover all the limbs and trunk of the trees. Whatever part of the scales are not hit by the wash will certainly not be killed."

A great many letters have been received from fruit-growers, widely separated, who have used crude oil, kerosene and California wash with encouraging results, and report the California wash to be growing in favor. From the many reports concerning the lime, sulphur and salt wash it seems fair to conclude that this will be the coming treatment for the scales. There is, however, room for much experimental work in the actual use of the wash as to its preparation and application.

Conclusions and Recommendations.

During the year the number of badly infested orchards has increased very materially, and when left to itself the scale has multiplied to such an extent that it has been distributed broadcast through infested sections. In many instances whole blocks of trees are practically useless through being sucked out, and thus weakened by the terrible drain, and the crop was so disqualified by disfiguration as to be unsaleable. The situation is really alarming, for under such conditions fruit growing is unprofitable and orchard property without value. But this cloud which has been hanging over the fruit-growers is breaking. The successful spraying done by some of themselves, and the results from our rather extensive experiments, demonstrate beyond question that no matter how much the treated trees may be exposed to reattacks, the scale may be effectively and profitably controlled. While we recognize that this is a bold assertion, we also feel that we have abundant evidence to warrant such a statement being made, and unhesitatingly encourage our friends to use the remedies recommended, with the assurance that each or any one of them will fulfil its mission if a proper application be made. A proper application will be so thorough and complete that every scale must be hit by its reaching every part of the tree, and such an application necessitates the expenditure of considerable material and time.

Whale oil soap is a mild remedy, and, to be effective, must be applied at full strength and in large quantity. We found that its excessive cost frequently stood in the way of enough being used.

An emulsion of fish oil, both with and without potash, proved very satisfactory in taking the place of soap. One year's experience does not justify speaking definitely of any remedy, but so far as we have tried it we like this very well as a substitute for soap.

Undiluted crude petroleum is a concentrated remedy, and must be applied lightly, which requires more time than when diluted with water, and we think the treatment, especially of large trees, is not so likely to be perfect as when a large quantity of spraying material is used. With proper care in making the treatment light it may be applied to the hardier varieties of fruit trees with safety.

Diluted crude oil is an excellent remedy to use on resistant varieties in the proportion of 20 per cent with water. Its penetrating and distributing qualities make it very searching, and assist greatly in getting a perfect covering. No preparation of the material is required, and, with the the pump in proper form, the application is rapidly made. There are many examples of its usefulness in treating apples, pears, and plums, some of which are practically clean. It is an

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excellent remedy for such varieties, as will withstand it, but is not suitable for peach trees. Very late applications apparently injure fruit buds, and we think diluted oil is less likely to injure foliage than when used with soap.

Crude oil emulsion may be applied with an ordinary pump, and in any percentage, which is a privilege to a great many, and, as a summer treatment, it may be used of sufficient strength to kill the scale without the trees being weakened from loss of foliage. There are such excellent results from its use that we consider it a valuable addition to our list of remedies.

Lime, sulphur, and salt has quite exceeded our expectations as an insecticide and cleans up the trees exceptionally well. It has many excellent features. The treated parts show as the wash dries, and this helps very much in making the treatment perfect which, as it does not spread, is absolutely necessary. It is really more effective than any other spray remedy we have tried, and is not so dependent on weather conditions as we were led to believe. The cost is such an important factor that, in spraying large orchards, it sometimes makes all the difference between success and failure. White wash is cheap, and for this reason is much more likely to be used in sufficient quantity to cover every part of the tree than a more expensive remedy would be, and with the aid of steam in cooking it can be supplied in large quantity. Peach trees may be treated at any time during the winter. It is entirely safe for any kind of fruit trees, and is particularly suitable for a mixed orchard. Where hired help is employed it may be used with impunity, and the quality of their work will be definitely shown.

Fumigation, or, "once for-all" method, may be advantageously used in cleaning valuable blocks of medium-sized trees not exposed to reattack. Where properly conducted we think it a perfect remedy for killing the scale, and it will not injure the trees. It is effective at any time of year, but much stronger gas must be used in winter when the scale is dormant, than when active in warm summer weather. The chief objections to its use are the cost of the outfit and danger from reinfestation.

Kerosene Emulsion. The pressing necessity for a safe and effective summer treatment makes the results from our experiments with kerosene exceedingly valuable. In common with other remedies the results were materially affected by weather conditions. In damp, or even dull weather, a large proportion of the insects were not killed, but in hot, dry weather the effect was instantaneous and complete. The material is everywhere available, there being no advantage in using the lighter grades. The emulsion is easily made and applied, and, proved the most satisfactory summer treatment we tried. Kerosene evaporates, and our experience is that the emulsion does not retain its useful qualities very long. A rather coarse nozzle is necessary.

Formulas.

Whale oil soap (for scale) 2½ pounds to the gallon of wash, thoroughly dissolved in a kettle over a fire applied while yet warm.

Fish Oil Emulsion. Five quarts fish oil emulsified with 1 pound of whale oil soap, or other good soap, in 5 pints of boiling water with 2½ pounds of caustic potash in solution added, and enough cold water to make 10 gallons. The emulsion may be used with or without potash.

Crude petro eum, undiluted, must be applied with a fine nozzle; diluted, it must be applied with a special pump.

Crude oil and soap may be used mechanically by adding the soap to the water in the barrel of the pump.

Crude Oil Emulsion. To properly emulsify 1 gallon of crude oil, 2½ pounds of soap are required.

Kerosene emulsion requires ½ pound of soap to 1 gallon of oil.

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In preparing an emulsion, place the oil in an open barrel. Dissolve the soap in one-half as much soft water as oil used, in a kettle over a fire, and bring to a boil. Throw the boiling soap and water into the barrel over the oil and churn violently, five minutes for kerosene or fish oil, and for crude oil a little longer; then churn more slowly while it is being increased to the required quantity with cold water. Soft water is always best for emulsions.

Lime, Sulphur and Salt. The proportions which gave the best results in last season's work were 30 pounds lime, 15 pounds sulphur, and 10 pounds salt, in 30 gallons of wash, and we really had the best results where no salt was used with these proportions. The sulphur should be pulverized. Slack the lime, which should be fresh, in boiling water, add the balance of the material, and boil at least 2 hours, stirring frequently, especially at the beginning and before removing the material to the pump. When finished it should be of a very deep amber color. The best authorities recommend two to three hours' boiling. The spray is more effective and easier to apply when hot, and contact with the air cools it sufficiently not to harm the trees.

Fumigation. 28.35 gram equals 1 ounce: 1 part cyanide of potash by weight; 1½ times as much sulphuric acid as potash by measure ; 1½ times as much water as sulphuric acid by measure ; make the formula.

¼ gram cyanide to each cubic foot enclosed, and an exposure of 45 minutes, are ordinarily used in fumigating nursery stock.

A heavier strength of gas is necessary for low temperature, and a lighter strength for summer use on foliage.

Trees in leaf should not be fumigated in the heat of the day, but early in the morning, late in the afternoon, or through the night and not at all when wet.

Any strong glass or glazed earthen vessel will serve for a generator.

The cost of the remedies per gallon of spraying material is as follows : Whale oil soap, 10 cents ; fish oil emulsion with potash, 6½ cents ; without potash, 5 cents ; crude petroleum, undiluted, 10 cents ; diluted to 20 per cent., 2 cents; crude oil and soap 2 cents to 4 cents; kerosene emulsion, 3 cents ; lime, sulphur and salt, 1 cent to 1½ cent.

To arrest the progress of the scale in sections where it has become widely distributed, or, in fact wherever it is found, it is necessary that the growers begin more vigorous treating at once. The situation will not admit of delay, and attention should at once be given to secure every available advantage. These have already been so fully explained that to repeat them here would be but to repeat the statement made in previous years. A brief outline, however, may not be out of place.

As it is the energy of the trees which is attacked, the best protection that can be given an affected orchard is to stimulate the growth. It should be carefully pruned, and if necessary, scraped. A full supply of spraying materials procured with suitable pumps and dress, if not already provided. It is important to be well provided before the spraying begins. We prefer to spray with white wash and with crude petroleum, during March and April, and with kerosene emulsion during the hot, dry weather in summer. It is claimed that California wash will corrode brass and copper, and that iron pumps are preferable for applying it. We have not observed this effect, but find it important to wash out the pump and attachment each day after use. The importance of following up any advantage is shown by the present condition of the Lockwood orchard, The results from the summer spraying were so good that the owner considered a second treatment in the spring unnecessary. Large trees cannot be successfully sprayed from the ground ; an elevated platform on the wagon with the pump, which will place one of the operators eight or ten feet above the ground,

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is necessary. The parasites imported from Maryland last year have not developed, and the little pentilla so plentiful in a Chatham orchard last fall were very scarce at the first of June. We reason from this that we need expect little help from parasitic or rapacious insects.

Notwithstanding the marked activity and consequent expansion of the scale in infested sections during the present year—as shown by the destruction of so many valuable trees and injury to fruit, and the greatly increased number of orchards that have become badly affected, which makes successful treating more difficult, we are assured that with this list of remedies, and the records they have made for efficiency, there is sufficient encouragement to afford a sense of security from the threatened destruction of the fruit industry. For results that are even satisfactory the treating must be very thorough, and in our experience we find that light applications can hardly be complete, a considerable quantity of material being necessary to make a perfect covering. The utility of a remedy depends not only upon its insecticidal qualities, but also upon the margin of safety it affords the tree, and there is a limit beyond which we cannot go with either crude petroleum or kerosene. The California remedy as a winter wash is entirely safe. It is also effective, cheap, and easily produced in large quantities. While under peculiar circumstances it may be more convenient to use another remedy, the California wash is undoubtedly the wash for the masses.

Our conclusions are based not only upon our own experience and observation, but we were bound to consider the important testimony received. From many parts of Canada and the United States, from Cape Colony and New South Wales, comes the same story of successful results from the use of the wash against scale insects. With our present knowledge of this intricate question, it is upon these three spray remedies that we must mainly rely, and if the treating be done according to instructions, and followed up year after year, they are abundantly competent and will give the necessary relief.

The measure of success which has attended the work of the present year is largely due to valuable assistance rendered by Mr. W. H. Bunting, of St. Catharines; Mr. J. W. Smith, of Winona; Mr. J. Fred Smith, of Glanford, and Mr. Jos. Healey, of Niagara, to whom I am indebted for many helpful suggestions and timely aid. It is my desire to give this fact due prominence that it may be fully recognized.

Yours very respectfully

GEO. E. FISHER.

Freeman, Dec. 31st, 1902.

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